

**Service Use Typologies Among Trauma-Exposed Children: The Roles
of PTSD and Dissociation**

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Nursing)
in the University of Michigan
2017

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ACKNOWLEDGEMENTS

Support for this research project was generously provided by the Rita & Alex Hillman Foundation Hillman Scholars Program in Nursing Innovation and the *Eunice Kennedy Shriver* National Institutes of Child Health and Human Development (NICHD) at the National Institutes of Health (NIH) through an individual National Research Service Award (NRSA) (1F31HD088091-01). This project was developed (in part) under grant number 2U79SM054284 from the Center for Mental Health Services (CMHS), Substance Abuse and Mental Health Services Administration (SAMHSA), U.S. Department of Health and Human Services (HHS). The views, policies, and opinions expressed are those of the authors and do not necessarily reflect those of SAMHSA or HHS. I would like to acknowledge the 56 sites within the NCTSN that have contributed data to the Core Data Set as well as the children and families that have contributed to our growing understanding of child traumatic stress. The National Center for Child Traumatic Stress (NCCTS) at Duke University School of Medicine facilitated access to the dataset used in this project and provided technical assistance throughout the study, and am very appreciative of assistance from Tracy Bethel, Robert Lee, Carrie Purbeck-Trunzo, and Courtney Fleck at NCCTS. Finally, I am grateful for the support, guidance, and expertise of my committee members, Dr. Julia Seng, Dr. Julian Ford, Dr. Ernestine Briggs-King, Dr. Michelle Munro-Kramer, and Dr. Sandra Graham-Berman.

FORWARD

The overall goal of this research study was to describe relationships between complex trauma, posttraumatic stress disorder (PTSD), dissociation, and service utilization among adolescents. As a clinician with an interest in health services research (HSR) and service systems as they relate to trauma, violence, and health, I originally approached this project with a specific interest in health outcomes and health service utilization. However, during project development and throughout the iterative process of conducting the study, the focus of the study became trauma-related mental health outcomes and trauma-related service utilization. This focus was due in part to nature of the dataset, but also due to following gaps in the literature that I learned of during my early years of doctoral study and following up some of the unexpected findings in the study. In the end, the nature of the project turned out to be an optimal blend of clinical research and HSR, which reflects my clinical training and experiences as well my future goals as a scientist.

Exploring these relationships as the foundation for my long-term research career was of interest for several reasons. First, I am interested in studying post-traumatic stress responses among youth who have experienced complex trauma. There is currently a need to examine the developmental impact of complex trauma and consider how the expression of trauma-related mental disorders and symptoms changes with developmental stage. I chose to focus specifically on adolescents to capture the transition from childhood to adulthood. The 5th edition of the *Diagnostic and Statistical Manual of Mental Disorders* contains updated criteria for diagnosis

PTSD and a new dissociative subtype of PTSD, and because these updates were created based primarily on studies of adults (although there were more developmental considerations and studies with youth than previous iterations, such as adding a preschool subtype of PTSD), the focus on adolescents for this project was intended to characterize the new dissociative subtype with a younger population. Second, the service utilization component of this project was selected because my particular area of interest for conducting research with trauma-affected youth is HSR. Although service utilization is only one component of the broader field of HSR, exploring relationships between trauma characteristics, trauma response, and service utilization related to trauma will generate big-picture information about how trauma survivors are accessing services and may point to areas for system-level intervention and new models of service delivery.

During my first year of PhD study, with these interests and goals in mind, I synthesized a theory of complex trauma, self-regulation, and service utilization that guided the development of this study. This framework is described in the introductory chapter. This theory uses psychology and nursing theories to delineate a framework where complex trauma exposure during early childhood leads to dysregulation of the self in multiple functional domains. Chronic self-dysregulation, then, leads to dysregulated service utilization and help-seeking patterns and prevents individuals from receiving needed services for treatment and recovery—and although the theory does not currently extend this far, it follows that we should then consider how our models of service delivery are themselves “dysregulated” and not functioning in optimal ways. At the very least, service systems are often not trauma-informed and are not always able to address the unique needs of trauma survivors. Although I had originally been interested in this theory from a clinical perspective, the theory bridges individual, clinical dysregulation with dysregulated service utilization, providing an important link between individuals and service

systems. This theory and the assumptions around trauma and self-dysregulation were the foundation for the constructs, measures, variables, and analyses in this study.

To address my research aims, I selected a sample of service-seeking, trauma-exposed adolescents from the National Child Traumatic Stress Network (NCTSN). I used the intake (baseline) data from the NCTSN Core Data Set (CDS) to explore these relationships for the sample at the onset of treatment. The measures of trauma-related mental disorders, then, capture adolescents who have not yet received trauma-specific treatment with NCTSN. The measure of service utilization captures services used in the 30 days prior to NCTSN service-seeking for trauma-related symptoms or issues. These characteristics of the CDS provide important context for the study. The constructs and variables of interest for my study are trauma-specific and provide information about mental health and service utilization related to trauma exposure.

The introductory chapter of this dissertation is an updated version of my original research project proposal that provides more context for the study, including a review of prior research, a theoretical framework for the study, and methods. The methods section documents the planned methods, data-driven decisions that occurred during the study, and how the planned methods differ from the methods in each manuscript. It is updated to reflect the changes that occurred during the analysis phase to make the rationale for the changes transparent, and it treats the three study aims as a single project.

Specific Aims

Childhood maltreatment is a significant threat to public health in the United States. In 2013, 679,000 cases of child abuse and neglect were reported, and 1,640 children were killed as a result of abuse (US Department of Health and Human Services [DHHS], 2015). Children who experience this type of trauma have disproportionately high rates of chronic mental and physical

health problems, as well as risk behaviors (Edwards et al., 2005). In addition to high chronic disease burden, individuals who were abused or neglected have more involvement with child welfare services and the juvenile justice system, as children, and higher rates of sexual assault and domestic violence victimization, homelessness, and criminality, as adults (Ford et al., 2010; Hetzel & McCrane, 2005; Spatz, 1989; Stein, Leslie, & Nyamathi, 2002). Considering the lifelong impact of chronic illness treatment and service utilization (defined as usage of any “services dealing with the diagnosis and treatment of disease, or the promotion, maintenance and restoration of health” [World Health Organization {WHO}, n.d.]), the cost of abuse and neglect to society is estimated to be over \$100 billion per year (Gelles & Perlman, 2012; Wang & Holton, 2007).

Posttraumatic stress disorder (PTSD) and dissociation are two key chronic mental health disorders that often follow child abuse and persist across the lifespan (Ackerman et al., 1998; Sanders & Giolas, 1991; Wolfe, Sas, & Wekerle, 1994). Most studies of these disorders have been conducted with adults, and although they are known to occur among children and adolescents as well, the life course of PTSD and dissociation over child development is not fully characterized. In children generally, posttraumatic stress manifests differently than it does among adults, and several different conceptualizations of posttraumatic stress disorders related to complex, developmental traumas have been proposed outside of the *DSM-5* to better capture posttraumatic symptom expression for pediatric populations (Cloitre et al., 2009; D’Andrea et al., 2009; Herman, 1992; van der Kolk et al., 2009). Among adolescents, who are transitioning from childhood to adulthood, diagnostic taxonomies, prevalence, and outcomes related to PTSD and dissociation are not well understood. PTSD is often a missed diagnosis in this population, and dissociation even more so (Berenson, 1998; Grasso et al., 2009). In 2013, a new edition of

the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)* was published with updated criteria for PTSD, including a dissociative subtype (PTSD-D; 14.4% of adult PTSD cases are the dissociative type) (American Psychiatric Association [APA], 2013; Stein et al., 2013). The dissociative subtype of PTSD has not yet been widely studied with adolescents, and addressing this gap is needed to examine the expression of trauma-related disorders during the transition from childhood to adulthood and to characterize how PTSD and dissociation manifest during this developmental stage.

Service utilization by trauma-exposed adolescents has also not been widely studied. Because victims of childhood trauma experience higher rates of physical and mental health disorders, in childhood and across the lifespan, they interface with physical and mental health service systems frequently. Research reports suggest that adults with PTSD have high rates of service usage and associated higher costs (Greenberg et al., 1999). The literature on service usage by children and adolescents is mixed with some prior studies suggesting high rates of service usage and others suggesting under-utilization (Briggs et al., 2013; Burns et al., 2004; Cole et al., 2016). Underlying patterns of service utilization have not been fully examined. Understanding patterns of service usage for adolescents will address an important gap in the literature and has potential to influence service delivery models to take trauma history into account in providing needed trauma treatment services, given evidence that trauma can have a profound impact on how people access and use professional services and cope with life stressors (Dallam, 2010; Substance Abuse and Mental Health Services Administration [SAMHSA], n.d.). The Substance Abuse and Mental Health Services Administration (SAMHSA) has listed trauma-informed care as a core competency for service professionals, and understanding service usage

patterns for adolescents with histories of trauma is an important first step in influencing service delivery systems to be more trauma-informed (SAMHSA, n.d.).

This quantitative study characterizes the dissociative subtype of PTSD among adolescents and applies latent class analysis to service usage data to derive typologies of utilization. Then, it examines the extent to which PTSD, dissociation, and PTSD-D are associated with service utilization among adolescents. The focus on adolescents in this study was selected to extend what is known about PTSD, PTSD-D, and service utilization to youth populations, beginning with adolescence as the last developmental transition from childhood to adulthood so that comparisons to adult populations can be made and to build a life course perspective on the expression of traumatic stress. The aims of the study are addressed using a sample of trauma-exposed adolescents ages 12 to 16 in a 2x2 contingency design from the National Child Traumatic Stress Network (NCTSN). The specific aims for the study are:

Aim 1: To describe the prevalence of PTSD, dissociation, and PTSD-D among adolescents with exposure to trauma based on standardized intake measure symptom profiles using *DSM-5* criteria: neither disorder, PTSD only, dissociation only, and both (PTSD-D) (manuscript 1);

Aim 2: To describe typologies of service usage by trauma-exposed adolescents (manuscript 2), and

Aim 3: To examine how PTSD and dissociation are associated with service usage typologies among adolescents with trauma exposure (manuscript 2).

After conducting preliminary analyses to address these aims, two post-hoc aims emerged that required exploration to fully understand the phenomena of interest:

Post-hoc Aim 1: To replicate an adult study of the dissociative subtype of PTSD looking for evidence of PTSD-D (depersonalization and derealization symptoms) among adolescents (manuscript 3), and

Post-hoc Aim 2: To examine the co-occurrence of PTSD and dissociation using a broader set of dissociation symptoms (manuscript 3).

In the end, these five aims are addressed in three separate manuscripts:

- (1) Relationships between maltreatment trauma, posttraumatic psychopathology, and the dissociative subtype of PTSD among adolescents (Aims 1 and 3),
- (2) Service usage typologies in a clinical sample of trauma-exposed adolescents: A latent class analysis (Aim 2), and
- (3) The dissociative subtype of PTSD among adolescents: Examining the co-occurrence of PTSD with depersonalization/derealization and other dissociation symptoms (Post-hoc aims 1 and 2).

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ABSTRACT

Childhood maltreatment is an important public health problem because it can impair child development and result in chronic physical and mental health disorders and increased social risk. The purpose of this study is to describe the prevalence of posttraumatic stress disorder (PTSD), dissociation, and the dissociative subtype of PTSD (PTSD-D) among adolescents with exposure to trauma, to describe typologies of service usage by trauma-exposed adolescents, and to examine the co-occurrence of PTSD and dissociation. This study used baseline data from the National Child Traumatic Stress Network (NCTSN) Core Data Set (CDS) collected from 2004 to 2010. The sample included 3,081 trauma-exposed adolescents ages 12 to 16 who were seeking clinical services at an NCTSN site. Psychopathology variables were PTSD, dissociation, and behavioral symptoms, measured with the UCLA PTSD Reaction Index, the Trauma Symptom Checklist for Children, and the Child Behavior Checklist. Latent class analysis was used to derive a model of service use typologies and PTSD/dissociation groups. This study illuminated the complex relationships between trauma, dissociation, posttraumatic stress, and service utilization in an adolescent population. The PTSD-D group, characterized by depersonalization and derealization, did not substantially differ from the PTSD-only group on trauma history or mental health measures. In a latent class model that accounted for a broader range of dissociation symptoms, distinct PTSD/dissociation groups emerged, including a dissociative subtype group, and PTSD-only group, and a unique dissociation group characterized by dissociative amnesia and detached arousal. There were five distinct service usage typologies with varying levels of

pattern complexity and intensity of level of care. Trauma itself, rather than PTSD or dissociation, was associated with service usage complexity. This study suggests that there is a need to broadly assess dissociation symptoms among adolescents in clinical settings and provide trauma-informed care in service sectors where they might be seeking treatment.

CHAPTER 1: Introduction

Background and Significance

The majority of people (69%) will experience at least one traumatic event in their lifetime, and up to 25% of those people will subsequently develop posttraumatic stress disorder (PTSD) (Resnick et al., 1993). According to the *DSM-5*, traumatic experiences can include direct or indirect exposure to actual or threatened death, actual or threatened serious injury, or actual or threatened sexual violence (APA, 2013). Childhood maltreatment, in particular, puts people at high risk for PTSD and many other adverse physical and mental health outcomes, and its prevalence is high. Approximately 25% of adults report childhood physical abuse, while 1 in 5 women and 1 in 13 men report childhood sexual abuse (WHO, 2014). Many more children experience traumatic exposure to violence (e.g., domestic violence, community violence, war conflict) and emotional or physical neglect (Stoltenborgh, 2013; WHO, 2014).

The adverse effects of childhood maltreatment are profound. In one of the largest studies of child abuse ever conducted, the Adverse Childhood Experiences (ACE) study, childhood maltreatment was predictive of many of the leading causes of death and chronic illness on a gradient, where increased severity of abuse increased risk for chronic physical and mental illness (Felitti et al., 1998). Abuse was predictive of depression, suicide attempts, alcoholism, and smoking, even after taking age, sex, race, and educational attainment into account. It also predicted obesity, ischemic heart disease, chronic lung disease, cancer, liver disease, skeletal fractures, and sexually transmitted infections (Felitti et al., 1998). Other epidemiological studies

have corroborated the results of the ACE study, leading to adoption of a life course perspective of abuse in public health (Anda et al., 2010; Chartier, Walker, & Naimark, 2010; Springer et al., 2007). Child maltreatment is now recognized as the foundation for a trajectory of social, emotional, and cognitive impairment, health risk behaviors, disease, disability, and, ultimately, early death (Centers for Disease Control and Prevention [CDC], 2014). Furthermore, child abuse is associated with high rates of service usage and high costs to society as whole. Economic impact studies accounting for costs associated with abuse-related service usage, including healthcare, hospitalizations, mental health care, productivity loss, child welfare services, criminal justice services, and special education estimate that the total cost of abuse to society in the US is \$103.8 billion to \$124 billion per year (Gelles & Perlman, 2012; Wang & Holton, 2007).

Although any trauma exposure can lead to symptoms of posttraumatic stress, evidence suggests that child abuse results in unique posttraumatic stress. Two frameworks for understanding and organizing the resulting posttraumatic symptomatology associated with child maltreatment include complex trauma and Developmental Trauma Disorder (DTD; Herman, 1992; van der Kolk et al., 2009). Complex trauma is conceptualized as the result of direct interpersonal harm that is repetitive, prolonged, and occurs at a developmentally vulnerable time in childhood, and DTD conceptualizes the posttraumatic stress symptoms and self-dysregulation resulting from complex trauma, which includes intense affect, avoidance, and behavioral reenactment of the trauma (Courtois & Ford, 2009). According to these theoretical perspectives, when maltreatment occurs during developmentally vulnerable times in a child's life, such as early childhood or early adolescence, self-regulation and self-definition are in critical formative stages and become dysregulated as a result of the trauma (Courtois & Ford, 2009). For very young children, trauma disrupts attachment security and forces neurological shifts in the child

from a “learning brain” to a “survival brain.” The survival brain is governed by fight-or-flight mechanisms and focuses on anticipating and responding to danger. Survival circumvents learning, and the brain will always exchange learning, growth, and self-development for survival and safety when faced with danger (Courtois & Ford, 2009; Teicher et al., 2002). Under-developing or losing self-regulatory processes as a result of trauma leads to self-dysregulation in a variety of biopsychosocial domains, affecting physical health, mental health, interpersonal relations, and behavior (van der Kolk et al., 2009).

By comparison, the *DSM-5* diagnostic criteria for PTSD treat all traumatic stressor exposures equally, and the corresponding symptom clusters (below) are generalizable to all types of trauma (APA, 2013).

[Insert Table 1]

Researchers and clinicians have questioned the applicability of the *DSM-5* diagnostic taxonomy for children exposed to complex trauma because it does not fully capture complex posttraumatic stress and have proposed alternative diagnostic frameworks, including complex trauma and DTD (Ford, 2015; Herman, 1992; Gigengack et al., 2015; Sar, 2011; van der Kolk et al., 2009; van der Kolk & D’Andrea, 2010). However, one strength of the *DSM-5* is that it includes one element of complex PTSD in a dissociative subtype of PTSD (Lanius et al., 2014; Wolf et al., 2012).

Dissociation is a state of detachment from reality that results when the usual integration of emotions, perceptions, senses, and cognition becomes fragmented. It is a defense mechanism against overwhelming traumatic experiences when there is no other escape, as is often the case with children who are being maltreated. Dissociation allows immediate escape from the external environment and from internal distress, but becomes maladaptive when it persists long after the trauma has ended in response to everyday stressors that do not actually pose a serious threat (van

der Hart et al., 2004). The dissociative subtype of PTSD includes two dissociation symptoms: depersonalization and derealization (Lanius et al., 2014). Depersonalization is the experience of seeing oneself outside of one's body, and derealization is the dream-like perception that things are not real. Both symptoms create the perception that 'this is not happening to me' and attenuate distressing emotional experiences (Lanius et al., 2014). Individuals with the dissociative subtype of PTSD, compared to individuals with PTSD alone, have generally experienced repeated traumatization and adverse early childhood experiences, have increased psychiatric comorbidity, and have increased functional impairment (Lanius et al., 2012; Wolf et al., 2012). This history and symptom profile reflects some components of complex trauma, making the question of describing PTSD under the new *DSM-5* diagnostic criteria in adolescents a clinically useful and timely exploration.

Despite improved knowledge of childhood maltreatment and its adverse health and economic outcomes, gaps in the literature remain. Posttraumatic stress and dissociation are often missed or misdiagnosed in children and adolescents (Berenson, 1998; Grasso et al., 2009). Although the *DSM-5* disease taxonomy appears to be appropriate for adult populations and less appropriate for young children, for adolescents transitioning from childhood to adulthood, it is not known whether the *DSM-5* PTSD criteria or other trauma conceptualizations (complex trauma, DTD) are most appropriate. Considering the similarities between the dissociative subtype of PTSD and complex trauma, examining the dissociative subtype of PTSD as an analog of complex PTSD and DTD in adolescents is needed for accurate diagnosis and appropriate treatment. Identifying the prevalence of PTSD and its dissociative subtype in adolescents under the new *DSM-5* diagnostic criteria is an important first step to help clinicians with correct diagnosis and treatment of traumatic stress in pediatric populations.

Furthermore, in light of the high rates of service usage by trauma-exposed individuals, understanding patterns of service usage is an important step in structuring service systems and making resource allocation decisions. The relationships between PTSD and dissociation as described in the new *DSM-5* are not yet known for adolescent populations. Between 2007 and 2010, children increased their overall usage of behavioral health services by 24% and usage of psychotropic medications by 10% (Health Care Cost Institute [HCCI], 2012), but studies of service utilization specific to trauma exposure among children are lacking. Research of service utilization by trauma-exposed children to date suggests that service delivery systems in the US are under-resourced, fragmented, and that children with behavioral health disorders under-utilize needed services. In a large prospective cohort study of mental health service needs and usage among child welfare-involved children, approximately half of the sample had a clinically significant emotional or behavioral problem warranting mental health services (Burns et al., 2004). However, only one-quarter of those children had received mental health services during the year prior to participating in the study (Burns et al., 2004). Neglected children and children residing at home were especially unlikely to receive needed mental health services, and other studies have found similar patterns of unmet mental health service needs among groups of children living in rural areas (Heflinger et al., 2015). Even when children with exposure to maltreatment and their families do access mental health services, delivering evidence-based interventions can be challenging, and service systems do not always accommodate the complex biopsychosocial needs of the child and family. System deficiencies often result in the placement of children in psychiatric hospitals or residential treatment centers, which are expensive and do not advance national goals of providing mental health services in the community rather than in institutions (Burns & Friedman, 1990; Institute of Medicine [IOM], 2009).

The behavioral and emotional impact of complex posttraumatic stress responses to child maltreatment trauma have been studied, but there is still a gap in the literature on the physical health impact of this sort of trauma exposure (Herman, 1992; van der Kolk et al., 2009). The conceptualizations of complex PTSD and DTD include somatization, a phenomenon in which real physical symptoms are experienced, but no organic cause can be found (e.g., nausea, chronic pain, headaches, gastrointestinal problems, neurological symptoms) (Greenberg, Dimsdale, & Solomon, 2016). Trauma and PTSD have been found to be associated with higher risk for blood disorders, gastrointestinal disorders, and infectious disease, among other illnesses, and complex PTSD has been associated with more psychosomatic disorders such as fibromyalgia (Seng et al., 2005). Little is known about healthcare service utilization for trauma survivors, and because mental and physical healthcare are not always well integrated, patterns of service utilization as they relate to the embodied, physical aspects of maltreatment are not well understood.

In contrast to studies of adults with PTSD where high rates of service utilization are a concern, these studies of children suggest that under-utilization is a concern and indicate a need for system-level research to improve systems of care and facilitate access, utilization, and ultimately, outcomes (Tuerk et al., 2013). Defining and understanding patterns of service usage in a multi-agency system of care that is current disintegrated and fragmented will illuminate dimensions of service usage and inform optimal system organization (Burns & Friedman, 1990). The focus of this research project on associations between trauma-related psychopathology and service usage patterns will clarify how trauma-exposed children are using systems of care and which components of care systems are being accessed. Examining service usage patterns for adolescents will also address the gap in knowledge of what happens during the adolescent years when people with a trauma history move from a general pattern of under-utilization in childhood

to over-utilization as adults. During adolescence, children begin to show increasing independence from their parents, experience mood fluctuations, increase their capacity for complex thought and emotional expression, and often highly value peer relationships (Centers for Disease Control [CDC], n.d.). These developmental characteristics are likely to influence patterns of service utilization in that adolescents have increased capacity for involvement and agency in decision making and help seeking related to their health, but still require parental involvement and guidance. Adolescents are still dependent on their parents for treatment consent, transportation, and understanding their treatment needs. In the context of adolescents experiencing increasing autonomy and independent identity formation—yet still undergoing cognitive, physical and sexual maturation—unique service utilization patterns are to be expected and can be used to inform better system design and service delivery models. By understanding service usage among this group, service delivery systems can be designed to reflect changing needs across the lifespan and ensure that individuals receive needed professional services. Understanding service usage patterns will also inform where trauma-informed service delivery is needed. This analysis will fill the gaps in the literature around post-traumatic mental health and service usage for improved service delivery for pediatric populations.

Theoretical Foundations

The theoretical foundation for this analysis is self-dysregulation theory (Choi, 2016; Courtois & Ford, 2009). According to this theory, complex psychological trauma results in dysregulation of a variety of biopsychosocial functional domains, including alternations in HPA axis, catecholamines, and oxytocin stress response and recovery systems, affect, impulse control, attention, consciousness, self-perception, interpersonal relations, somatic function, and systems of meaning (Teicher et al., 2002; Luxenburg, Spinazzola, & van der Kolk, 2001). This

dysregulation also adversely affects self-regulatory processes for coping with stressful healthcare or other professional service experiences, leading to maladaptive coping strategies that ultimately impact one's service utilization, interactions with service systems, and overall health (Choi, 2016; Courtois & Ford, 2009; Dallam, 2010; Johnson, 1999). Thus, trauma-informed service delivery is essential at the individual, family, community, system, and policy levels (SAMHSA, n.d.). A basic conceptual framework for self-dysregulation following complex psychological trauma and its effect on health service encounters is presented below (a more detailed substruction in relation to the proposed study is described in the methods section of this proposal) (Choi, 2016):

[Insert Figure 1]

Although the *DSM-5* PTSD diagnostic taxonomy does not use a self-dysregulation framework, for this analysis, posttraumatic stress and dissociation will be conceptualized as manifestations of trauma-related self-dysregulation, and health service utilization will be conceptualized more broadly as any trauma-related service utilization. This framework will allow for an integrated exploration of the *DSM-5* diagnostic taxonomy within the self-dysregulation framework proposed by DTD.

Pilot Study

To determine the feasibility of the proposed research, a pilot study was conducted using a preexisting dataset (R01 NR008767, PI: Seng) from a PTSD cohort study of pregnant women (n= 839). The aims of the pilot study were to:

- (1) Describe the proportions of PTSD and dissociation using the new *DSM-5* diagnostic taxonomy,
- (2) Describe perinatal service usage typologies, and

(3) Examine how PTSD and dissociation explain perinatal service usage typology.

These aims are exactly parallel to the aims of this proposal. The dataset was well-suited to piloting the proposed research because it contained parallel measures, variable structure, and operationalization of the key constructs. The sample contained nulliparous women who were selected for their childhood maltreatment trauma experiences. Twenty perinatal services were examined, including services for antepartum, intrapartum, and postpartum care, mental health and chronic illness care during pregnancy, pharmacy services, and social services.

Aim 1 (Method: Frequencies and descriptive statistics, logistic regression): The proportions of women with PTSD and dissociation in the sample are described in the table (below). The overall proportion of women who had the PTSD dissociative subtype was 14.1%, which is remarkably consistent with population studies of PTSD (i.e., 14.4%; Stein et al., 2013).

[Insert Table 2]

In the logistic regression model, child maltreatment trauma (relative to non-maltreatment trauma) increased the odds of dissociation and PTSD. Demographic variables were not associated with dissociation or PTSD.

Aim 2 (Method: Latent class analysis, entropy analysis, qualitative analysis): A five-class solution emerged as the optimal model for service usage typologies using AIC (Akaike Information Criterion) and evaluating the classes substantively (Bozdogan, 1987). Other class enumeration criteria were considered, but AIC was prioritized in enumerating the final model. Each of the five classes was adequately sized, distinct, and conceptually meaningful: (1) high combination—high physical, mental, and perinatal service usage, (2) high perinatal—high perinatal service usage, (3) medium combination—medium physical, mental, and perinatal service usage, (4) medium perinatal—medium perinatal service usage, and (5) low (reference

class)—low physical, mental, and perinatal service usage. A five-factor nominal variable was created using these service usage types to proceed with Aim 3.

[Insert Table 3]

Aim 3 (Method: Multinomial logistic regression using log-linear canonical link): PTSD and socioeconomic risk were significantly associated with higher-intensity service usage classes. PTSD status increased the odds of High Combination service usage by 2.11 (95% CI= 1.28, 3.48) and the odds of Medium Combination service usage by 2.39 (95% CI= 1.30, 4.40), relative to Low service usage. Socioeconomic risk was inversely associated with Medium combination service usage. Dissociation was not significantly associated with any service usage type.

[Insert Table 4]

The results of this pilot study confirm the feasibility of the proposed analysis. Additionally, the results support the hypothesis that posttraumatic stress, a subjectively distressing response, leads to increased help seeking and service utilization, while dissociation, a reaction characterized by auto-attenuation of distress, does not (Lanius et al., 2010; Seng, D’Andrea, & Ford, 2014).

Methods

Design and Dataset

This secondary analysis uses an observational design to examine relationships between trauma, self-dysregulation (PTSD and dissociation), and service utilization in adolescents. The dataset for this analysis was the National Child Traumatic Stress Network (NCTSN) Core Data Set (National Child Traumatic Stress Network [NCTSN], 2009; Steinberg et al., 2014). The NCTSN is collaborative network of clinicians, researchers, and families across the United States focused on addressing child traumatic stress by raising the standard of care for child trauma and

improving access to evidence-based services (National Child Traumatic Stress Network [NCTSN], 2009; Steinberg et al., 2014). The network is funded by the Center for Mental Health Services, the Substance Abuse and Mental Health Services Administration, and the US Department of Health and Human Services through the congressional Donald J. Cohen National Child Traumatic Stress Initiative. The network had 79 funded members as of November 2015. The CDS was established as part of a quality improvement effort by NCTSN. It contains systematically collected clinical data on demographics, trauma characteristics, clinical evaluations, service utilization, and evidence-based interventions for over 10,000 trauma-exposed children from 56 NCTSN sites across the US. The data were collected from 2004 to 2010 (NCTSN, 2009). This dataset is the first collection of behavioral health data that uses standardized assessment measures to systematically examine trauma, function, and treatment (NCTSN, 2009). It also uses standardized outcome measures with a consistent time frame and data collection protocol across all sites.

The NCSTN CDS is well suited to the aims of this proposal for studying trauma, trauma-related mental health, and trauma-related service utilization. Although the CDS contains primarily behavioral health outcome data and does not have information on other outcomes that would have been optimal to study (e.g., health outcomes), it allows for an analysis of trauma-specific service utilization and relationships between utilization patterns and trauma-related mental disorders, which addresses a significant gap in the literature. The clinical sample is large, diverse, and represents trauma-exposed children from across the US, and the standardized measures of psychopathology and service usage allow for reliable, valid, and clinically useful examination of the proposed relationships among variables. Furthermore, the dataset contains nineteen distinct variables for service utilization resulting from trauma-related problems,

including services related to physical health, mental health, emergency room care, legal services, child welfare, and residential treatment. This broad range of service data will allow development of clinically useful service typologies that capture the far-reaching dysregulating effects of trauma across many functional domains.

The University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board has reviewed and approved this study (Appendix A). A data use agreement has been established with the National Center for Child Traumatic Stress (NCCTS) at Duke University School of Medicine (Appendix B). Throughout the analysis process, consideration was given to the target audience for the results and the clinical utility of the results. Thus, some data-driven decisions were made during the analysis to enhance the clarity and clinical utility of the study and its findings.

Sample and Setting

The sample for this analysis was selected from the NCTSN Core Data Set. The NCTSN sample is a clinical sample of trauma-exposed children and adolescents seeking trauma-related services at an NCTSN site. For this analysis, inclusion criteria for the sample was that participants must (1) be ages 12 to 16, and (2) have baseline and trauma history data available. Including older adolescents (ages 17 and 18) would have been ideal, but there are too few older adolescents in the CDS (less than 1% of the sample; see limitations in the discussion). Cases were selected only if they had complete baseline data and trauma data to limit missing data. One of the primary aims of the analysis was to identify proportions of PTSD and dissociation as defined in the *DSM-5* (APA, 2013). The sample was divided into four diagnostic groups using a 2x2 contingency table: PTSD only, dissociation only, PTSD dissociative subtype, and neither.

[Insert Table 5]

Power Analysis

Preliminary analyses indicated that the sample size meeting the specified inclusion criteria was 4,537. Although this study is descriptive and power analysis is generally used for hypothesis testing in experimental research, the study includes statistical hypothesis testing for aims 1 and 3 and warrants a power analysis (Faul et al., 2009; Lachin, 1981). There were no specific data to inform our effect size, but even a small effect size would be of interest. Therefore we calculated the sample size needed to detect a small effect. According to a power analysis using chi-square goodness of fit test with a contingency table, a sample size of 1,647 will yield 90% power to detect, at the 5% significance level, a small ($w = 0.1$) effect size (Faul et al., 2009; Faul, Erdfelder, Lang, & Buchner, 2007). The notation w represents effect size index for a chi-square goodness of fit and contingency test (Cohen, 1992). This power analysis was conducted *a priori* with a given alpha ($\alpha = 0.05$), power level ($1 - \beta = 0.90$), and effect size ($w = 0.1$) to calculate the sample size ($n = 1,647$). Given the sample size of 4,537 from preliminary analyses, the study was adequately powered to answer the research questions.

Measures

The key constructs used in this analysis were: (1) trauma, (2) self-dysregulation, operationalized as PTSD and dissociation, which includes the 2x2 contingency table groups of PTSD alone, dissociation alone, and PTSD-D, and (3) service utilization. Trauma and service utilization were measured using intake assessment data from the NCTSN CDS. PTSD and dissociation were measured using the University of California-Los Angeles Posttraumatic Stress Disorder Reaction Index (UCLA PTSD-RI) and the Trauma Symptom Checklist for Children-Alternate Version (TSCC-A), respectively (Briere, 1996; Steinberg et al., 2004). These data were collected by individual clinicians at NCTSN sites using a standardized intake protocol and

timeframe during treatment. In addition to the three main constructs, demographic information was extracted from the dataset (age [0-16 continuous], race [American Indian/Alaskan Native, Asian, Black/African American, Native Hawaiian/Pacific Islander, White, Unknown categorical], ethnicity [Hispanic/Latino, Not Hispanic/Latino, Unknown categorical], gender [Female, Male, Other, Unknown categorical], primary residence [Independent, Home with parents, With relatives or other family, Regular foster care, Treatment foster care, Residential treatment center, Correctional facility, Homeless, Unknown, Other categorical], public insurance status [Public Insurance Yes/No]).

Trauma was measured using the General Trauma Information Form in the NCTSN Core Data Set. This form asks clinicians to indicate which of twenty different types of trauma exposure the child has experienced with the responses ‘Yes,’ ‘No,’ ‘Suspected,’ or ‘Unknown.’ Clinicians also indicate the age when the trauma exposure occurred (0 to 18 years or ‘Unknown’) for each trauma exposure endorsed. The types of trauma exposure assessed by the General Trauma Information Form include sexual maltreatment/abuse, sexual assault/rape, physical maltreatment/abuse, physical assault, emotional abuse/psychological maltreatment, neglect, domestic violence, war/terrorism/political violence in the US, war/terrorism/political violence outside the US, illness/medical trauma, serious injury/accident, natural disaster, kidnapping, traumatic loss/bereavement, forced displacement, impaired caregiver, extreme interpersonal violence not reported elsewhere, community violence not reported elsewhere, school violence not reported elsewhere, and other trauma not reported elsewhere. Each trauma type includes a definition on the form.

PTSD was measured using the ULCA PTSD-RI for *DSM-IV* (Elhai et al., 2013; Steinberg et al., 2004; Steinberg et al., 2013). The ULCA PTSD-RI is a 48-item measure administered in

an interview or in self-report form assessing the three *DSM-IV* symptom clusters: intrusive re-experiencing, avoidance/numbing, and hyper-arousal (APA, 2000; Elhai et al., 2013; Steinberg et al., 2013). Symptom items are self-reported on a five-point scale (0/None, 4/most) and are considered present for scores of 2 or greater. A PTSD diagnosis was made based on the presence of symptoms meeting *DSM-IV* diagnostic criteria (at least one B cluster item, at least three C cluster items, and at least two D cluster items; this diagnosis did not consider level of functional impairment) (APA, 2000). The psychometric properties of this instrument have been validated with a large, national, ethnically diverse, clinical sample of 6,291 children from the NCTSN Core Data Set (Steinberg et al., 2013). The ULCA PTSD-RI had excellent internal consistency reliability ($\alpha=.88-.91$) across demographic groups (age range, race, sex), and higher scores on the ULCA PTSD-RI were associated with higher odds of functional and behavioral problems. Its factor structure reflected the *DSM-IV* symptoms clusters, and exploratory analysis of its factor structure demonstrated convergent validity with the posttraumatic stress subscale of the Trauma Symptom Checklist for Children-Alternate Version (TSCC-A), the other psychometric instrument included in this study (Elhai et al., 2013).

The TSCC-A is a 44-item measure of traumatic stress symptoms designed for children ages 8 to 16 years, although it can also be used for children 17 years of age (Briere, 1996). The TSCC-A is an alternate version of the TSCC, which included 54 items, six clinical subscales (anger, anxiety, depression, dissociation, posttraumatic stress, sexual concerns), two validity scales (hyperresponse, underresponse), and eight critical items that indicate a need for further assessment (e.g., “wanting to kill myself”). It uses a 4-point scale (0/Never to 3/Almost all the time) for children to self-report on each item. The TSCC-A differs from the TSCC in that it does not include a sexual concerns subscale and has seven rather than eight critical items. The original

version of the TSCC was validated with a nationally representative, diverse, non-clinical sample of 3,008 children (Briere, 1996). It demonstrated excellent internal consistency reliability ($\alpha > .80$) and concurrent validity with the Child Behavior Checklist (CBCL), a gold standard measure of internalizing and externalizing behavior in young children (Achenbach, 1991; Briere, 1996). Children with abuse histories, who would be expected to display significant symptoms of posttraumatic stress, have been found to score high on the TSCC, and scores decrease over time for children receiving trauma-related treatment (Lanktree & Briere, 1995). The alternate version of the TSCC omits items related to sexual victimization that might be distressing for children or ethically concerning and is recommended for use in settings where sexual victimization is less likely (e.g., school setting versus forensic or clinical setting) (Briere, 1996).

Internalizing and externalizing behavior symptoms were measured using the Child Behavior Checklist for Ages 6 to 18 (CBCL) (Achenbach, 1991; Achenbach & Rescorla, 2001). The CBCL is a widely used, standardized measure of emotional and behavioral problems among children. It contains 112 items and is completed by the child's parent or caregiver. The CBCL has the following subscales: aggression, anxious/depressed, attention, emotional reactivity, rule-breaking, somatic complaints, social problems, sleep problems, thought problems, and withdrawn/depressed. These subscales load on to two broadband scales: internalizing and externalizing behavior problems. The behavioral items are reported on 3-point Likert scales (0/Not true, 2/Very true or often true). The CBCL creates standardized t-scores using a normative sample by age and gender, where scores are scaled so that 50 is the normative score for the child's age and gender with a standard deviation of 10 (Achenbach, 1991; Achenbach & Rescorla, 2001). Higher scores indicate more behavioral problems (Achenbach, 1991; Achenbach & Rescorla, 2001). Scores below 60 are considered in the normal range, scores of 60

to 63 are considered borderline, and scores higher than 63 are considered in the clinical range (Achenbach, 1991). The CBCL has consistently demonstrated strong reliability and validity for both parent-report (Cronbach's $\alpha = 0.80$) and clinician-report (Cronbach's $\alpha = 0.77$) formats in clinical samples of adolescents (Achenbach et al., 1991; Cohen et al., 1985; Dutra et al., 2004). The internalizing and externalizing broadband scales have also demonstrated convergent and discriminant validity with criterion variables such as poor school functioning, criminality, personality disorders, abuse history, substance abuse, suicidality, and poor family relationships (Achenbach, 1991; Cohen et al., 1985; Dutra et al., 2004).

Service utilization was measured using Service Utilization Form from the NCTSN CDS. This form asks respondents indicate which of nineteen different trauma-related services the child has received in the past 30 days with the responses 'Yes,' 'No,' or 'Unknown.' The services include inpatient psychiatric unit or hospital for a mental health problem, residential treatment center, detention center/training school/jail/prison, group home, treatment foster care, probation officer/court counselor, day treatment program, case management/care coordination, in-home counseling, outpatient therapy, outpatient treatment from a psychiatrist, primary care physician/pediatrician for symptoms related to trauma or emotional/behavioral problems, school counselor/school psychologist/school social worker, special class/special school, child welfare/Department of Social Services, foster care, therapeutic recreation services/mentor, hospital emergency room, and self-help groups.

To link the theoretical framework, measures, and variables for this study, a substruction diagram was constructed showing the conceptual framework for this study, including operationalizing measures, variables, and levels of measurement (Dulock & Holzemer, 1991). Substruction is a technique to link theoretical and operational systems in a research study by

identifying variables, their respective levels of measurement, and relationships between theoretical and operational constructs (Dulock & Holzemer, 1991). Substructuring the theoretical framework for this study provides a visual depiction of how each major theoretical construct will be operationalized in measurement, which variables will be used in the analysis, and the levels of measurement for each variable. The elements of the substruction for the current study's theoretical framework of trauma, self-dysregulation, and service usage are shown in Figure 2.

[Insert Figure 2]

To further delineate relationships between the theoretical and operation systems for this study, Table 6 displays substruction elements and the corresponding study aims.

[Insert Table 6]

Procedure

The NCTSN Publication Review Committee (PRC) reviewed and approved the study. The University of Michigan Institutional Review Board approved this study. A data use agreement was arranged between the University of Michigan and Duke University School of Medicine. The analysis was conducted at the NCCTS at the Duke University School of Medicine. Additionally, the project was supported by an Individual National Research Service Award application to the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) at the National Institutes of Health with the co-sponsorship shared by Dr. Julia Seng and NCTSN investigators, Dr. Julian Ford and Dr. Ernestine Briggs-King. Robert Lee at NCCTS created the analytic file and consulted on all aspects of the analysis plan so that consistency with NCTSN norms was assured. The analysis was conducted at NCCTS during May 2016.

The dataset was obtained in the form of a de-identified, delimited file and analyses were conducted using R version 3.2.2 and Mplus (R Core Team, 2015). Specific packages used for the analysis were the poLCA package, nnet package, and R base packages (Linzer & Lewis, 2011; R Core Team, 2015; Venables & Ripley, 2002). A detailed data analysis plan with analytic steps and decisions is shown in Appendix C.

Variables

The NCTSN has numerous variables that have been previously used across studies (Betancourt et al., 2012; Briggs et al., 2012a; Briggs et al., 2013; Cole et al., 2016; Contractor et al., 2013; Dierkhising et al., 2013; Fraynt et al., 2014; Greeson et al., 2011; Greeson et al., 2014; Kiesel et al., 2014; Kiser et al., 2014; Murphy et al., 2014; Pynoos et al., 2014; Spinazzola et al., 2014; Suarez et al., 2012). These variables were used in their most current form to be consistent with NCTSN norms. These variables included (1) trauma type (maltreatment or all other types of trauma), (2) age of trauma exposure, and (3) number of trauma exposures. Study-specific variables were created as follows from raw NCTSN data consistent with the conceptual framework, levels of measurement, and NCTSN conventions:

- A proxy variable for sociodemographic risk using public health insurance status (Kiser et al., 2014; Briggs et al., 2012; Greeson et al., 2011; Greeson et al., 2014),
- A dichotomous (yes/no) trauma variable categorizing the trauma type as maltreatment or other trauma. Maltreatment will be defined as sexual abuse, physical abuse, neglect, or emotional abuse that is confirmed or suspected. For children that have more than one type of trauma, the presence of at least one type of maltreatment will be considered criteria for inclusion in the maltreatment group (Spinazzola et al., 2014),

- A dichotomous (yes/no) dissociation variable using the depersonalization and derealization items from the TSCC-A. The categorization will be ‘yes’ if one of these items reaches a cutoff score of 2 or higher (‘lots of times’) or if both of these items are scored 1 (‘sometimes’). This conceptualization of dissociation is consistent with the *DSM-5*. The preexisting score and cutoff variables will be used for PTSD, and
- A count of service usage (0-19) variable (Briggs et al., 2013; Cole et al., 2016; Suarez et al., 2012).

The specific variable names for each construct are listed in Appendix D. The following table displays the independent and dependent variables and their structure for each study aim.

[Insert Table 7]

Descriptive statistics were to examine the variables of interest. For continuous variables (PTSD score, PTSD criteria B through D score, dissociation total score, service utilization count), residual plots were produced to assess for constant variance, produce Q-Q plots to examine distributional assumptions, and Durbin-Watson tests were used to check for error independence. Scatterplots and bivariate correlations were used to assess for linear relationships between variables. For dichotomous or polytomous variables (all others), frequencies and proportions were used to describe the sample.

Missing Data

Because the NCTSN Core Data Set contains clinical assessments, some missing data are to be expected. Thus, having complete baseline and trauma history data available in the dataset were selected as an inclusion criterion for the sample to be used in this analysis. Frequencies were used to assess for missing data on subsequent measures within this sample. The original plan for handling missing data was to omit cases missing modest proportions of item-level data

(defined as 9% or less) for each specific analysis (Bennet, 2001). Evidence suggests that this amount of missing data does not introduce significant bias into the results. If large amounts of item-level data (10% or greater) were missing from key variables, multiple imputation methods were the planned method for handling missing data using the ‘mice’ package to generate multivariate imputations by chained equations using predictive mean matching (van Buuren & Groothuis-Oudshoorn, 2011). The number of imputations would depend on the proportion of missing data and the acceptable power falloff as described by Graham, Olchowski, & Gilreath. (2007). Assuming an acceptable power falloff of 5% or less, three imputations would be needed for data missing at the level of 10% to 29% and ten imputations would be needed for data missing at the level of 30% to 69% (Graham, Olchowski, & Gilreath, 2007). In the end, data-driven decisions were made to handle missing data differently. Cases missing all data on PTSD and dissociation (defined as depersonalization/derealization) were omitted from the sample because these were important outcome variables. Item-level data were missing in low proportions (less than 10%), but rather than using different samples for each analysis, we opted to code these missing data as “no” responses (i.e., if the clinician did not record the symptom or trauma exposure, it was assumed to be absent). This approach has some limitations in that it is possible that there were other reasons why symptoms or trauma exposures were not recorded. It also introduces a bias toward under-diagnosis. However, the study used clinical data and this approach is consistent with the medical-legal assumption that information must be noted in a client’s medical record for it to be considered present (Low, Seng, & Miller, 2008).

Psychometric Analyses

The TSCC-A and the ULCA PTSD-RI were the instruments of choice for NCTSN. Internal consistency reliability was assessed for the sample as a whole and for two age groups,

younger adolescents (12-13) and older adolescents (14-16). Although the TSCC-A can be used for children as young as 8 years of age, children under the age of 12 were not included in this analysis because the goal of the study was to capture unique characteristics of the adolescent age group, to bridge what is known about adults to the pediatric population and establish a foundation for future studies of younger children that can ultimately be used to describe the life course perspective of PTSD. Internal consistency reliability is a measure of the degree to which test items collectively reflect the same construct (Henson, 2001). It is important in psychometric testing to assess the performance of psychometric tools and also in research to evaluate effect size estimates (Henson, 2001). In this study, the internal consistency reliability estimates for the UCLA PTSD-RI and the TSCC-A subscales were used to evaluate the reliability of the measures within the selected age group.

Primary Analyses

To address aim 1, frequencies were used to report the proportions of PTSD and dissociation in a 2x2 contingency table. The four groups—PTSD only, dissociation only, PTSD dissociative subtype, neither—were created using the ULCA PTSD-RI and the depersonalization and derealization items from the TSCC-A. The proportions of PTSD and dissociation for the sample were compared across the following subgroups using chi-square tests: (1) maltreatment trauma and non-maltreatment trauma groups, (2) trauma exposure before and after age 6, (4) male and female gender, and (5) white, black, and other racial groups. Originally, the plan for assessing relationships between trauma characteristics (maltreatment trauma, age of trauma exposure, number of trauma exposures) and each of the four PTSD/dissociation factors described above (using age, gender, and sociodemographic risk as covariates) was to estimate four logistic regression models because the main audience for this aim's results was likely to be a clinician

audience, for whom logistic regression modeling would be more familiar. In the end, a data-driven decision was made to use a multinomial logistic regression model rather than four separate models because the single model more clearly demonstrated how trauma exposure type and characteristics explained PTSD and dissociation. Because the *DSM-5* is not consistently used for diagnosis in this age group by practitioners, quantifying associations between maltreatment characteristics and psychopathology as described by the *DSM-5* was an important step toward assessing the clinical utility of the new dissociative subtype and making recommendations for its use in practice with adolescents (Wakefield, 2016; Scheeringa, Zeanah, & Cohen, 2011).

To address aim 2, latent class analysis (LCA) was used to identify service usage typologies for the sample of trauma-exposed adolescents. The overall purpose of LCA is to identify unobserved heterogeneity (i.e., an unobserved latent variable) in a population (Nylund, Asparouhov, & Muthén, 2007; Raykov, 2015). In a traditional LCA, both the observed variables and the latent variable are categorical, in contrast to similar data reduction methods such as exploratory or confirmatory factor analysis (observed and latent variables are continuous), nonlinear factor analysis (observed variable is categorical, latent variable is continuous), and finite mixture modeling (observed variable is continuous, latent variable is categorical) (Raykov, 2015). These approaches to data reduction are summarized in Table 8.

[Insert Table 8]

A major advantage of LCA methods is that it is a model-based approach to data reduction, meaning that it uses statistical indices to define a model with structural and measurement parameters that can be used to predict the probability of a given response pattern (Raykov, 2015). This contrasts with cluster analysis methods that are not model-based, but rather use distance measures and hierarchical clustering algorithms to group objects that are most similar

(Raykov, 2015). Cluster analysis is a purely descriptive technique and does not give probabilities of certain responses within clusters or the probability of belonging to a certain cluster, characteristics that are often of interest to researchers (Rencher, 2003; Raykov, 2015). There are two LCA model parameters that can be used to describe the resulting classes and characterize the population: (1) item-response probabilities, the probability of a certain response on a given item conditional upon latent class membership and (2) class prevalence, the probability of a subject belonging to a given class (Lanza et al., 2007; Raykov, 2015). The number of latent classes (i.e., unobserved latent variable) is not considered a model parameter, and classes are enumerated by fitting several models with the same observed variables and comparing the models (Raykov, 2015). There are six commonly used methods and statistical fit indices available for selecting the optimal latent class model, as shown in Table 9 (Nylund, Asparouhov, & Muthén, 2007).

[Insert Table 9]

The 19 dichotomous service utilization variables were collapsed into 10 variables reflecting 5 domains of service utilization (healthcare, mental health, social services, school, and justice) and 2 levels of intensity (high and low) for each domain (see Table 10).

[Inert Table 10]

LCA was applied to these 10 dichotomous service usage variables for the entire sample. To select the optimal number of latent classes, the following statistical fit indices were evaluated: Bayesian Information Criterion (BIC), Akaike Information Criterion (AIC), Lo-Mendell-Rubin Likelihood Ratio Tests, and Bootstrap Likelihood Ratio Tests. These class enumeration techniques were selected because they have been demonstrated to select the best-fit, most parsimonious model in simulation studies (Nylund, Asparouhov, & Muthén, 2007). The models resulting from these four class enumeration methodologies were compared with one another to

confirm the best-fit model. Typologies were also evaluated conceptually to ensure that they had real-world meaning.

Based on the best-fit model parameters and class characteristics, the classes were named to reflect their statistical and substantive characteristics. The naming of the classes was a qualitative judgment made in collaboration with content experts on the committee.

To address aim 3, a multinomial logistic regression model was estimated to examine how each PTSD/dissociation factor predicts service usage typology. Multinomial logistic regression is used to predict or explain a polytomous outcome variable (Kwak & Clayton-Matthews, 2002). The resulting odds ratios are interpreted relative to a predetermined reference category. To estimate the multinomial logistic regression model, a nominal variable of the service usage typologies resulting from aim 2 was constructed, which was the multivariate dependent variable for the regression analyses. Then, PTSD (dichotomous), dissociation (dichotomous), and PTSD-D (dichotomous) variables were used to predict service usage typology in a multinomial logistic regression model, with covariates for age, gender, race, maltreatment trauma exposure, number of trauma exposures, and age when the trauma exposure occurred. There was originally also a plan to estimate k (k = number of latent classes) logistic regression models to predict service usage typologies, using PTSD, dissociation, PTSD-D, and the same covariates listed above and to evaluate whether the logistic regression models allowed for clearer interpretability of results, but in the end, the multinomial model was appropriate and meaningful and was retained for reporting results.

Summary

To summarize the methodological approach to this research project, the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement is used to review

each methodological component of the study (von Elm et al., 2008). The STROBE statement is a checklist designed to improve the quality of research reports describing observational studies. Although the STROBE checklist is not considered a tool for designing or conducting research studies, reviewing the elements of the STROBE checklist can nevertheless aid investigators in considering how studies will be reported while the study is still in the design phase (von Elm et al., 2008). Thus, each of the elements of the STROBE checklist (excluding “results” and “conclusions” items) and how they are addressed by this study are listed in Table 11 to succinctly depict the plan for the analyses across all three aims.

[Insert Table 11]

Contingency Plan

A contingency plan was established for this project because the specific aims were closely related and built upon one another, allowed for a rigorous conceptual evaluation of the hypothesized relationships among variables, but also required successful completion of aims 1 and 2 before aim 3 could be approached. The plan in this case was to use service usage frequency (0-19 interval-level variable) as an alternative outcome variable and to use multiple linear regression rather than multinomial logistic regression. However, in the end, this contingency plan was not needed.

Strengths and Limitations

The overall goal of the analysis was to examine relationships among service usage, PTSD, and dissociation among trauma-exposed adolescents using the *DSM-5* PTSD diagnostic criteria and the dissociative subtype of PTSD. This analysis fills an important gap in the literature and has potential to influence diagnostic paradigms for posttraumatic stress in adolescents. It also has potential to inform service delivery models and system-level

interventions to be more trauma-informed and to better meet the needs of adolescents with exposure to trauma. The strengths and limitations of the project as they were evaluated prior to beginning the project are as follows.

The analysis had some limitations to consider related to the constraints of the data set. The NCTSN Core Data Set measured PTSD using the *DSM-IV* diagnostic criteria, which have recently changed in the *DSM-5*. Although this was a limitation, using the PTSD diagnosis per *DSM-IV* in combination with the dissociative subtype symptoms described in the *DSM-5* still permits us to answer the core pieces of the question: What is the estimated prevalence of dissociation and the subtype in adolescents, and what predicts these outcomes? What are the patterns of service usage when the dissociative symptoms are taken into account? The limitation of using PTSD DSM-IV symptom clusters is balanced by the ability to use depersonalization and derealization items from the TSCC-A to create dissociative subtype cases. Another limitation of the dataset was that service usage data were available for only the 30 days prior to treatment seeking. This time frame may not fully capture the range of services used to address trauma-related symptoms and may underestimate service usage. To minimize the effects of this limitation, I chose a conceptual framework of self-dysregulation, which recognizes far-reaching, trauma-related symptoms that are distressing and likely to lead to treatment seeking even long after the trauma has ended. This theory assumes increased service seeking to address dysregulation in several functional domains, and thus I expected to see service utilization within the 30-day window specified in the dataset. A third limitation was that although we know that trauma exposure and posttraumatic stress are associated with physical morbidity, the NCTSN focuses primarily on behavioral health, and thus the healthcare service utilization data were focused on trauma-related problems. This conceptualization allows for evaluation of trauma-

related service utilization, but is incomplete as a contribution to understanding service utilization for physical health problems. This limitation cannot be overcome in this study, but can be a priority for future research where this approach can be replicated and extended to include for-purpose data. A final limitation was it was not possible to include 17- and 18-year-olds in the sample because they did not have valid data for all measures, and thus this analysis falls short of being able to describe the entire gap from 12 years to adulthood. This two year late adolescent period also will await a replication and extension study.

The analysis had strengths as well. The dataset selected for analysis was a good fit for the project specific aims and allowed for a well-powered, clinically useful analysis. The measures had established reliability and validity in the population of interest. The use of the new *DSM-5* diagnostic taxonomy for PTSD was a timely exploration that filled a gap in the literature and has potential to influence diagnosis, treatment, and service delivery for survivors of trauma. Finally, the pilot study described above demonstrated the feasibility of the analysis and provided preliminary support for the proposed relationships among variables.

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Table 1: DSM-5 PTSD Symptom Clusters

<i>DSM-5 PTSD Symptom Clusters</i>
B. Intrusion
C. Avoidance
D. Negative alterations in mood and cognition
E. Alterations in arousal and reactivity

Table 2: Pilot Proportions of PTSD and Dissociation

		Dissociation	
		Yes	No
PTSD	Yes	4.3% (36)	26.1% (219)
	No	5.1% (43)	68.8% (577)

Table 3: Pilot Latent Class Enumeration

Number of classes	AIC	BIC	Likelihood ratio test	X^2	Entropy
2 classes	11878.35	12072.37	2511.53	2368057	7.03
3 classes	11709.71	12003.11	2300.89	7780478	6.91
4 classes	11603.37	11996.15	2152.55	192608.5	6.83
5 classes	11570.18	12062.33	2077.36	149864.4	6.78
6 classes	11583.39	12174.92	2048.57	44632.67	6.77

Table 4: Pilot Multinomial Logistic Regression Models

Odds Ratios								
Class	High Combination		Medium Perinatal		High Perinatal		Medium Combination	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
PTSD	2.11* *	1.28, 3.48	1.38	0.78, 2.47	1.05	0.75, 1.90	2.39**	1.30, 4.40
Dissociation	1.49	0.56, 3.99	1.23	0.38, 4.09	1.12	0.42, 3.05	1.27	0.38, 4.29
Socioeconomic Risk	0.69* *	0.56, 0.86	1.91**	1.63, 2.25	2.62**	2.29, 3.01	0.92**	0.74, 1.15

Table 5: PTSD/Dissociation Contingency Table

		Dissociation	
		Yes	No
PTSD	Yes	PTSD dissociative subtype	PTSD only
	No	Dissociation only	Neither

Table 6: Substruction Table with Study Aims

Concept Substruction			
Concepts			
Trauma	Self-Dysregulation		Service Usage
Aims 1 & 3	Aims 1 & 3		Aim 2 & 3
Measures			
Trauma experiences	Trauma Symptom Checklist for Children	UCLA PTSD Reaction Index for <i>DSM-IV</i>	Past 30-day service usage
Variables and Levels of Measurement			
Maltreatment Trauma exposure	Dissociation: Total Score	PTSD Total Score	Services
Nominal: Yes/No	Ordinal treated as interval: 0-3	Interval: Score: 0-88 Nominal: Cutoff Yes/No	Count: 0-19 Nominal: Yes/No
Age of trauma exposure	Dissociation: Depersonalization	PTSD Criterion B	
Nominal: Before/after age 6	Nominal: Yes/No	Interval: Score Nominal: Cutoff Yes/No	
Sociodemographic Risk	Dissociation: Derealization	PTSD Criterion C	
Nominal: Public insurance Yes/No	Nominal: Yes/No	Interval: Score Nominal: Cutoff Yes/No	
Number of trauma exposures		PTSD Criterion D	
Interval: 0-20		Interval: Score Nominal: Cutoff Yes/No	

Table 7: Independent Variables, Dependent Variables, and Covariates by Study Aim

Aim	Independent Variables	Dependent Variables	Covariates
1	<ul style="list-style-type: none"> • Maltreatment trauma <ul style="list-style-type: none"> ○ Dichotomous 	<ul style="list-style-type: none"> • PTSD <ul style="list-style-type: none"> ○ Dichotomous • Dissociation <ul style="list-style-type: none"> ○ Dichotomous 	<ul style="list-style-type: none"> • Age of trauma exposure <ul style="list-style-type: none"> ○ Dichotomous • Number of trauma exposures <ul style="list-style-type: none"> ○ Interval • Gender <ul style="list-style-type: none"> ○ Categorical • Insurance status as a proxy for sociodemographic risk <ul style="list-style-type: none"> ○ Dichotomous
2	<p>All dichotomous:</p> <ul style="list-style-type: none"> • Primary care provider • Hospital emergency room • Outpatient therapy • Outpatient psychiatrist • Inpatient psychiatric unit • Case management • In-home counselling • Group home • Foster care • Treatment foster care • Therapeutic recreation or mentor • Department of social services • Day treatment program • Residential treatment center • School counsellor • Special classes or school 	<ul style="list-style-type: none"> • Latent class membership variable <ul style="list-style-type: none"> ○ Polytomous 	<ul style="list-style-type: none"> • N/A

	<ul style="list-style-type: none"> • Self-help groups • Detention center/jail • Probation officer or court counsellor 		
3	<ul style="list-style-type: none"> • PTSD <ul style="list-style-type: none"> ○ Dichotomous • Dissociation <ul style="list-style-type: none"> ○ Dichotomous 	<ul style="list-style-type: none"> • Latent class membership variable <ul style="list-style-type: none"> ○ Polytomous ○ Dichotomous 	<ul style="list-style-type: none"> • Age of trauma exposure <ul style="list-style-type: none"> ○ Dichotomous • Number of trauma exposure <ul style="list-style-type: none"> ○ Interval • Maltreatment trauma exposure <ul style="list-style-type: none"> ○ Dichotomous • Gender <ul style="list-style-type: none"> ○ Categorical • Insurance status as a proxy for sociodemographic risk <ul style="list-style-type: none"> ○ Dichotomous

Table 8: Comparison of Analysis Techniques by Variable Structure

	Observed Variable →	Continuous	Discrete
Latent Variable ↓			
Continuous		Factor Analysis (FA): exploratory (EFA) and confirmatory (CFA)	Item Response Theory (IRT), or Latent Trait Theory (LTT) (Nonlinear Factor Analysis)
Discrete		Latent Profile Analysis (LPA), Finite Mixture Models	Latent Class Analysis (LCA): Cross-sectional Growth Mixture Models: Longitudinal

Table 9: Class Enumeration Methods

Method	Description	Strengths	Limitations	Statistical Software Options
Chi-square test	<ul style="list-style-type: none"> Compares k and $k-1$ models using a chi-square difference test in the form of a likelihood ratio test 	<ul style="list-style-type: none"> Likelihood ratio is chi-square distributed under limited regularity assumptions (when the degree of freedom for the difference test equals the difference in the number of parameters of the two models) 	<ul style="list-style-type: none"> LCA models are often not chi-square distributed and thus standard difference testing is not appropriate 	<ul style="list-style-type: none"> Mplus R SAS
Akaike's Information Criteria (AIC)	<ul style="list-style-type: none"> Estimates the amount of information lost among models used to represent observed data Penalizes additional of parameters, thus selecting the best-fit and most parsimonious model 	<ul style="list-style-type: none"> Well studied as a model fit index 	<ul style="list-style-type: none"> Performance of BIC is superior to AIC in simulation studies Different ICs may point to different model solutions using the same observations that must be evaluated against substantive theory or other statistical methods 	<ul style="list-style-type: none"> Mplus R SAS
Bayesian Information Criteria (BIC)	<ul style="list-style-type: none"> Estimates the amount of information lost among models used to represent observed data 	<ul style="list-style-type: none"> Well studied as a model fit index Superior to other IC methods in simulation studies 	<ul style="list-style-type: none"> Different ICs may point to different model solutions using the same observations that must be evaluated 	<ul style="list-style-type: none"> Mplus R SAS

	<ul style="list-style-type: none"> • Penalizes additional of parameters, thus selecting the best-fit and most parsimonious model. • Penalization term is larger than AIC, thus favoring more parsimonious models than AIC 	<ul style="list-style-type: none"> • Larger penalization term selects more parsimonious models 	against substantive theory or other statistical methods	
Lo-Mendell-Rubin Likelihood Ratio Test (LRT)	<ul style="list-style-type: none"> • Compares neighboring models (k and $k-1$) • Returns a p-value indicating whether or not there is a statistically significant improvement in model fit by adding 1 class. • Uses approximation to the LRT distribution 	<ul style="list-style-type: none"> • Maximum likelihood estimates are generally consistent, unbiased, and normal with large samples 	<ul style="list-style-type: none"> • Application in practice has been limited to date • The performance of this test for LCA models has not been widely studied 	<ul style="list-style-type: none"> • Mplus
Bootstrap Likelihood Ratio Test (BLRT)	<ul style="list-style-type: none"> • Estimates the distribution of the LRT statistic using bootstrap samples • Returns a p-value indicating whether or not there is a statistically 	<ul style="list-style-type: none"> • Empirically estimates the distribution of the test statistic rather than assuming a known distribution 	<ul style="list-style-type: none"> • Application in practice has been limited to date • The performance of this test for LCA models has not been widely studied 	<ul style="list-style-type: none"> • Mplus

	significant improvement in model fit by adding 1 class.		<ul style="list-style-type: none"> Not commonly implemented in mixture modeling software 	
Agreement with Substantive Theory	<ul style="list-style-type: none"> Evaluate models (i.e., number of classes, model parameters) against substantive theory to determine appropriateness of fit Appropriate for use in conjunction with a statistical method of determining goodness-of-fit 	<ul style="list-style-type: none"> Evaluating against substantive theory prevents reification of latent variables (Resulting typologies could be an artifact of the specific methods used to obtain them) 	<ul style="list-style-type: none"> Appraisal can be subjective Different theoretical frameworks may support different models of the same latent constructs 	<ul style="list-style-type: none"> N/A

Table 10: Service Usage Variables

Domain	Intensity	Service Usage
1. Healthcare	High/Low	Primary care provider, hospital emergency room
2. Mental Health	High/Low	Outpatient therapy, outpatient psychiatrist, inpatient psychiatric unit, residential treatment center
3. Social Services	High/Low	Case management, in-home counselling, group home, foster care, treatment foster care, therapeutic recreation or mentor, department of social services
4. School	High/Low	School counsellor, special classes or school
5. Justice	High/Low	Detention center/jail, probation officer

Table 11: STROBE Statement

	Item No	Recommendation	How the current research project addresses STROBE recommendations
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	The abstract indicates that this study is observational.
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	The abstract summarizes the problem this research project addresses and the methodological approach used to answer the research question.
Introduction			
Background/ rationale	2	Explain the scientific background and rationale for the investigation being reported	The introduction and background section describes the problem of child maltreatment trauma including current epidemiological trends, theoretical frameworks and diagnostic classification systems, major controversies in the field, and the potential contribution of the research study.
Objectives	3	State specific objectives, including any prespecified hypotheses	The study purpose and specific aims are specified, including a hypothesis for aim 3 which requires statistical testing.
Methods			
Study design	4	Present key elements of study design early in the paper	The opening sentence of the methods section notes the study design.
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	The methods section identifies the setting of data collection (56 NCTSN centers), dates (2004-2010), and other pertinent information about NCTSN and the data collection process for the Core Data Set.
Participants	6	(a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up Case-control study—Give the eligibility criteria, and the sources and methods of case	The eligibility criteria for inclusion in the study are specified (age limit; availability of two sets of data); participants will be selected from the pre-existing NCTSN Core Data Set based on meeting the inclusion criteria.

		ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	Not applicable
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	The outcomes, predictors, and covariates are identified for each aim in Table 7. The diagnostic criteria used are the <i>DSM-IV</i> criteria for PTSD and the <i>DSM-5</i> criteria for the dissociative subtype of PTSD.
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Table 6 and Figure 2 describe each variable used in the analysis, their level of measurement, and the theoretical system from which the variables were operationalized. All data will come from the NCTSN Core Data Set.
Bias	9	Describe any efforts to address potential sources of bias	The statistical and theoretical methods for class enumeration have been specific <i>a priori</i> . Multiple imputation will be used to mitigate biases in missing data. The data set was selected because it is national, clinical sample.
Study size	10	Explain how the study size was arrived at	The sample size a given, and its adequacy was verified to be sufficient using a power analysis which is described in the methods section.
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	The analysis plan describes how each variable will be used for each aim. Table 6 displays the level of measurement for each variable. Table 7 displays which variables

			are independent, dependent, and covariate for each aim.
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	The statistical methods for each aim are described in the analysis section.
		(b) Describe any methods used to examine subgroups and interactions	The subgroups (PTSD, dissociation, both, none; maltreatment trauma exposure, non-maltreatment trauma exposure) and their role in each aim are described in Table 6.
		(c) Explain how missing data were addressed	The methods section describes how missing data will be handled. Listwise deletion will be used for 5-10% missing data; for more than 10% missing data, multiple imputation will be used.
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(e) Describe any sensitivity analyses	This project does not include sensitivity analysis

Figure 1: Trauma and Self-Dysregulation during Health Service Encounters

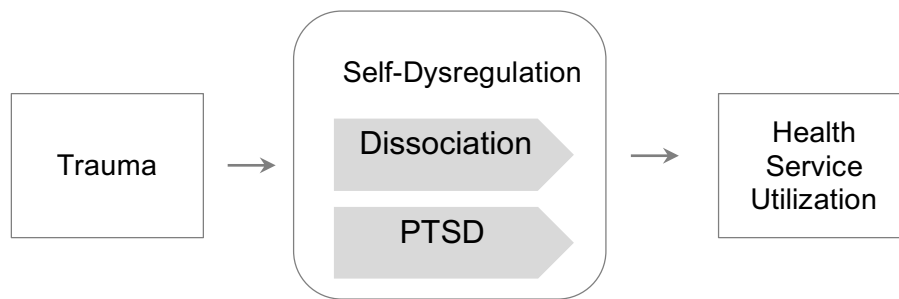
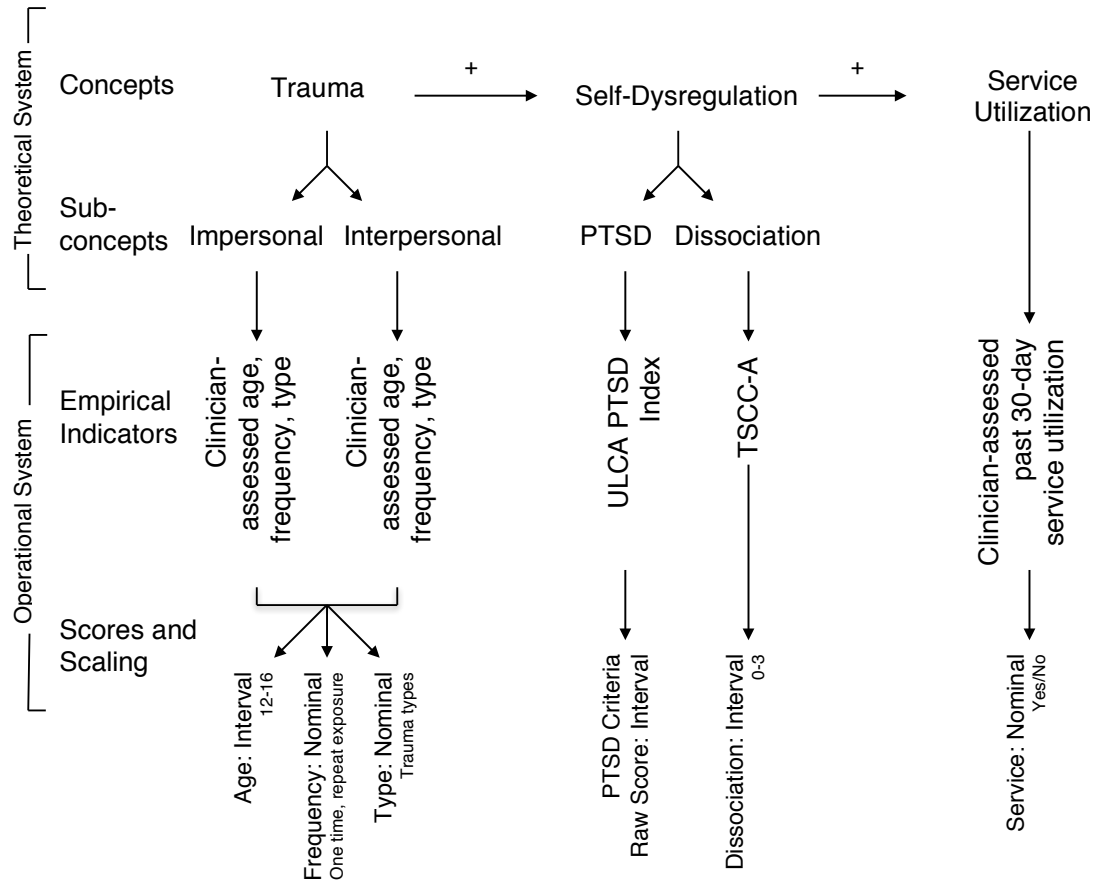


Figure 2: Substruction of Theoretical Framework



CHAPTER 2: Relationships between maltreatment, posttraumatic psychopathology, and the dissociative subtype of PTSD among adolescents

Abstract

Posttraumatic stress disorder (PTSD) and dissociation following child maltreatment are often missed or misdiagnosed among children and adolescents. Recent studies of adults have begun to better characterize the co-occurrence of PTSD and dissociation, but there are few studies of PTSD and dissociation among pediatric populations. The purpose of this study was to characterize posttraumatic stress disorder (PTSD), dissociation, and the dissociative subtype of PTSD (PTSD-D) among adolescents with maltreatment exposure at ages 12 to 16. A clinical sample of trauma-exposed adolescents from the National Child Traumatic Stress Network Core Data Set was used to describe the three groups and explore associations between trauma history characteristics, sociodemographic factors, PTSD, and dissociation. Results indicated that 53.7% of adolescents who met criteria for PTSD also met criteria for the dissociative subtype. The PTSD-only and PTSD-D groups were similar overall on all measures of psychopathology and trauma history characteristics (early childhood trauma exposure, sexual abuse, physical abuse, and maltreatment count) and were both more likely to be female, although the PTSD-D group had fewer trauma exposures and was slightly less symptomatic than the PTSD-only group. PTSD and depersonalization/derealization, separately or together, were related to emotional abuse and to externalizing and internalizing problems. Adolescents with PTSD-D were more likely to be

living in residential treatment than other groups, and maltreatment increased the odds of having PTSD, dissociation, or both. This study provides evidence about the dissociative subtype of PTSD among adolescents and provides new directions for research on PTSD and dissociation. Given the minimal differences between the PTSD and PTSD-D groups found in this study, future research studies should explore the co-occurrence of PTSD and dissociation with broader range of dissociative symptoms than only depersonalization/derealization, including dissociative amnesia, to further understand how to diagnosis and treat traumatic stress disorders among adolescents.

Introduction

Child maltreatment affects more than 700,000 children each year and often increases their risk for chronic mental illness and psychosocial challenges in childhood and across the lifespan (U.S. Department of Health and Human Services [DHHS], 2016). Specifically, posttraumatic stress disorder (PTSD) and dissociative disorders have been found to have strong associations with child maltreatment (Ackerman et al., 1998; Cecil et al., 2017; Dorahy et al., 2016; Sanders & Giolas, 1991; Wolfe, Sas, & Wekerle, 1994). PTSD is a cluster of symptoms representing a disordered stress response to shocking, frightening, or dangerous events (National Institute of Mental Health, 2016). Dissociation is state of detachment from reality that results when the usual integration of emotions, perceptions, senses, and cognition becomes fragmented (Lanius et al., 2012). It is a defense mechanism against overwhelming traumatic experiences when there is no other escape, as is often the case with children who are being maltreated. Although PTSD and dissociation are relatively well characterized in adults, less is understood about epidemiology, diagnosis, treatment, and outcomes of these trauma-related phenomena for the pediatric population, particularly in relation maltreatment.

PTSD is often a missed diagnosis in youth, and dissociation even more so, because posttraumatic stress and posttraumatic stress related to maltreatment manifest differently in children than in adults (Berenson, 1998; Grasso et al., 2009). In 2013, a new edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)* was published with updated criteria for PTSD, including a dissociative subtype of PTSD (PTSD-D; 14.4% of adult PTSD cases are the dissociative type) that was intended to capture the group of PTSD-affected individuals with complex trauma histories and sequelae (American Psychiatric Association [APA], 2013; Friedman, 2013; Stein et al., 2013). Prior to the publication of the *DSM-5*, several different conceptualizations of posttraumatic stress disorders had been proposed to better capture complex posttraumatic symptom expression. For example, complex PTSD, developmental trauma disorder, and disorders of extreme stress were proposed frameworks for capturing the far-reaching impact of trauma across multiple functional domains (Cloitre et al., 2009; D'Andrea et al., 2009; Herman, 1992; van der Kolk et al., 2009). Researchers and clinicians have questioned the applicability of the *DSM-5* diagnostic taxonomy for youth exposed to complex trauma because it does not fully capture complex posttraumatic stress (Herman, 1992; van der Kolk et al., 2009). However, PTSD-D now allows for diagnosis of pathological traumatic stress that includes co-occurring dissociation symptoms, an important domain of complex posttraumatic stress (Lanius et al., 2014; Wolf et al., 2012b).

Dissociation allows immediate escape from the external environment and from internal distress, but becomes maladaptive when it persists long after the trauma has ended in response to everyday stressors that do not actually pose a serious threat (van der Hart et al., 2004). The dissociative subtype of PTSD includes two dissociation symptoms: depersonalization and derealization (Lanius et al., 2014). Depersonalization is the experience of seeing oneself outside

of one's body, and derealization is the dream-like perception that things are not real. Both symptoms create the perception that 'this is not happening to me' and attenuate distressing emotional experiences (Lanius et al., 2014). Individuals with the dissociative subtype of PTSD, compared to individuals with PTSD alone, have generally experienced repeated traumatization and adverse early childhood experiences, have increased psychiatric comorbidity, and have increased functional impairment (Lanius et al., 2012; Wolf et al., 2012b). This history and symptom profile reflects some components of complex trauma, making the question of describing PTSD under the new *DSM-5* diagnostic criteria a clinically useful exploration.

Much of the research on PTSD-D to date has been focused on adult populations, leaving a gap in the literature for children, adolescents, and consideration of developmental transitions. It is important to account for the complex biological and psychosocial changes that occur with child development and examine stages of child development individually. Because research to date has focused primarily on adults, beginning with adolescents in the final stage of child development first will bridge the gap between childhood and adulthood expression of PTSD. In general, adolescent PTSD and adult PTSD tend to be similar, but adolescents are more likely to display aggression, poor impulse control, and traumatic reenactment (Hamblen & Barnett, 2016). There are also some important differences in the expression of dissociation in adolescents compared with adults. Adolescents tend to display less dramatic changes in voice, mood, and mannerisms, shorter and harder-to-notice trance states that may be mistaken for inattentiveness, and lack of insight that dissociated parts or voices the adolescent is experiencing are not normal (Dalenberg et al., 2012; International Society for the Study of Trauma and Dissociation [ISSTD], n.d.). Although there is a need to study younger children as well, capturing the developmental stage of adolescence should occur first to determine optimal taxonomies for mapping

posttraumatic stress symptoms among youth who are closest to adulthood and to allow comparison to both adults and younger children in the future.

Although the *DSM-5* disease taxonomy appears to be appropriate for adult populations and less appropriate for young children, for adolescents, it is not known whether the *DSM-5* PTSD criteria or other trauma conceptualizations (e.g., complex trauma, DTD) are most appropriate. One study of trauma-exposed adolescents involved in juvenile justice found an 83% prevalence rate for PTSD-D, but few studies on this topic have been conducted (Kerig et al., 2016). Considering the similarities between the dissociative subtype of PTSD and complex trauma, examining the dissociative subtype of PTSD as an analog of complex PTSD and DTD in adolescents is needed for accurate diagnosis and appropriate treatment. Characterizing PTSD and its dissociative subtype in adolescents under the new *DSM-5* diagnostic criteria is an important first step to help clinicians with correct diagnosis and treatment of traumatic stress in pediatric populations, particularly the adolescent population that is transitioning from childhood to adulthood.

The purpose of this study was (1) to describe the prevalence of PTSD, dissociation, and PTSD-D among adolescents with exposure to trauma based on *DSM-5* criteria: neither disorder, PTSD only, dissociation only, and both (PTSD-D), and (2) to examine associations between trauma history, demographics, and PTSD/dissociation

Methods

Design

This descriptive study was a secondary analysis of baseline data from the National Child Traumatic Stress Network (NCTSN) Core Data Set (CDS) (National Child Traumatic Stress Network [NCTSN], 2009; Steinberg et al., 2014). This dataset was created as part of a quality

improvement effort by NCTSN and is a unique collection of behavioral health data derived using standardized assessment measures to methodically examine trauma, function, and treatment (NCTSN, 2009). The dataset contains systematically collected clinical data on demographics, trauma characteristics, clinical evaluations, service utilization, and evidence-based interventions. The CDS contains data from 56 NCTSN sites across the US that were collected from 2004 to 2010 (NCTSN, 2009). The CDS was well-suited to the aims of this study because it contained a large, diverse sample, it included both maltreatment and non-maltreatment trauma exposure data, and the selected outcome measures allowed for an analysis of the *DSM-5* PTSD dissociative subtype.

Participants

The CDS contains a total of 14,088 children ages 0 to 21. For the current study, a subset of the full NCTSN sample was selected to include adolescents ages 12 to 16 who had at least one trauma exposure ($n= 3081$) and who were not missing data for the two outcome variables of PTSD and dissociation (defined as the *DSM-5* dissociative subtype). This age range was selected to capture the adolescent developmental stage in examining PTSD and dissociation, and because evidence suggests that younger children express posttraumatic stress differently than adolescents and adults (Scheeringa et al., 2003).

Procedure

This analysis project underwent ethical review and was approved by the University of Michigan Institutional Review Board. Additional information about the CDS is reported elsewhere (Briggs et al., 2012; Greeson et al., 2014; Steinberg et al, 2014).

Measures

Demographics. Demographic variables included in this analysis were age (years), gender (male, female), race (White, Black, Hispanic, Other), place of residence (with parents, with other relatives, foster care, residential treatment, other), and insurance status, which served as a proxy for socioeconomic risk (private, public, both, neither). The insurance status variable has been used in this manner for several previous NCTSN projects (Briggs et al., 2012; Greeson et al., 2011; Greeson et al., 2014; Kiser et al., 2014).

Trauma. Trauma exposures and characteristics were measured with the CDS General Trauma Information Form, which was based on the Trauma History Profile (THP) portion of the UCLA PTSD-RI (Steinberg et al., 2004). This form was assessed via clinician interviews with the child and caregiver. The form asks clinicians to indicate which of 20 different types of trauma exposure the child has experienced with the responses ‘Yes,’ ‘No,’ ‘Suspected,’ or ‘Unknown.’ Clinicians also indicate the age when the trauma exposure occurred (0 to 18 years or ‘Unknown’) for each trauma exposure endorsed. The trauma exposures of interest for this analysis were the 4 maltreatment exposures: (1) physical abuse, (2) sexual abuse, (3) emotional abuse, and (4) neglect. The age at which the maltreatment occurred (before age 6 or after age 6) was examined to identify the developmental impact of maltreatment. Generally, maltreatment before age 6 is considered early childhood maltreatment, which can result in unique and complex variants of posttraumatic stress responses (Courtois & Ford, 2009; Herman, 1992). Finally, two count variables were constructed of the total number of trauma exposures (1-20) and the total number of maltreatment trauma exposures (0-4).

Behavioral symptoms. Internalizing and externalizing behavior symptoms were measured using the Child Behavior Checklist for Ages 6 to 18 (CBCL) (Achenbach, 1991; Achenbach & Rescorla, 2001). The CBCL is a widely used, standardized measure of emotional

and behavioral problems among children. It contains 112 items and is completed by the child's parent or caregiver. The CBCL has the following subscales: aggression, anxious/depressed, attention, emotional reactivity, rule-breaking, somatic complaints, social problems, sleep problems, thought problems, and withdrawn/depressed, which load onto two broadband scales: internalizing and externalizing behavior problems. The behavioral items are reported on 3-point Likert scales (0/Not true, 2/Very true or often true), and the broadband t-scores were used for the analysis. These standardized scores are based age- and gender-normed standardized scores, where 50 is the mean score with a standard deviation of 10 for each age (6–10 years, 11–18 years) and gender (girls, boys) group (Achenbach, 1991). Scores higher than 63 are considered clinically significant levels of behavioural problems (normal scores are below 60; scores of 60 to 63 are considered borderline) (Achenbach & Rescorla, 2001). The internalizing symptoms subscale internal consistency reliability was 0.90, and the externalizing symptom subscale was 0.92.

PTSD. PTSD was measured using the University of California Los Angeles Posttraumatic Stress Disorder Reaction Index for *DSM-IV* (ULCA PTSD-RI) (Elhai et al., 2013; Steinberg et al., 2004; Steinberg et al., 2013). The ULCA PTSD-RI is a 48-item measure available in self-report or interview form assessing the three *DSM-IV* symptom clusters: intrusive re-experiencing, avoidance/numbing, and hyper-arousal (APA, 2000; Elhai et al., 2013; Steinberg et al., 2013). The items on the UCLA-PTSD-RI map directly onto the *DSM-IV* PTSD symptom clusters and allow for a PTSD diagnosis based on the *DSM-IV* criteria for the disorder (APA, 2000). Symptom items are reported on a five-point scale (0/None, 4/most) for a total symptom count of up to 20. Symptoms were considered present for scores of 2 or greater, and a PTSD diagnosis was made based on *DSM-IV* diagnostic criteria (at least one B cluster item, at

least three C cluster items, and at least two D cluster items; this diagnosis did not consider level of functional impairment) (APA, 2000). For the sample used in this study, the overall internal consistency reliability on the UCLA PTSD-RI was 0.93.

Dissociation. Because the purpose of this study is to examine the *DSM-5* dissociative subtype of PTSD, in this study, dissociation is defined according to the *DSM-5* diagnostic criteria for the dissociative subtype. This definition includes two dissociation symptoms: (1) depersonalization, and (2) derealization. These symptoms were measured using the Trauma Symptom Checklist for Children-Alternate Version (TSCC-A). The TSCC-A is a 44-item measure of traumatic stress symptoms designed for children ages 8 to 16 years (Briere, 1996). The TSCC-A is an alternate version of the TSCC, which included 54 items, six clinical subscales (anger, anxiety, depression, dissociation, posttraumatic stress, sexual concerns), two validity scales (hyperresponse, underresponse), and eight critical items that indicate a need for further assessment (e.g., “wanting to kill myself”). It uses a 4-point scale (0/Never to 3/Almost all the time) for children to self-report on each item. The TSCC-A differs from the TSCC in that it does not include a sexual concerns subscale and has seven rather than eight critical items. The alternate version of the TSCC omits items related to sexual victimization that might be distressing for children or ethically concerning (Briere, 1996). The two dissociation symptoms examined in this study were considered present for scores of 2 or higher on a 0 (never) to 3 (almost all of the time) scale. For the sample used in this study, the overall internal consistency reliability for the TSCC-A was 0.97. The internal consistency reliability for only the depersonalization/derealization items was 0.69.

Data Analysis

Cases missing all data on either of the two primary outcome variables (PTSD, dissociative subtype) were listwise-deleted from the sample. All other data appeared to be missing in low proportions (<10%) with no distinguishable patterns of missingness and were coded as ‘no’ responses (i.e., if the clinician did not record the symptom or trauma exposure, that item was assumed to be absent) (Low, Seng, & Miller, 2008).

Frequencies and descriptive statistics were examined for all variables used in the analysis. The sample was divided into four groups using a 2x2 contingency table: (1) PTSD-only, (2) dissociation-only, (3) both PTSD and dissociation, which represents the dissociative subtype of PTSD (PTSD-D), and (4) neither. Chi-square tests and ANOVA tests with pairwise follow-up tests were used to compare the four groups on demographics, trauma history, and psychopathology symptoms. A multinomial logistic regression model was estimated to examine associations between demographic variables, trauma history variables, and PTSD/dissociation group. All analyses were conducted using R, version 3.2.3, and the statistical significance level was set at 0.05 for all analyses.

Results

Sample

The mean age of the sample was 14.5 years (SD= 1.45). The sample was 60.5% female and 39.5% male. The racial proportions of the sample were 32.4% white, 22.9% black, 36.9% Hispanic, and 6.0% other. Public insurance status was considered a proxy variable for socioeconomic risk, and 61.2% of the sample had public insurance. Sixty-two percent of the sample resided with their parents, while 11.8% were living with other relatives, 8.9% were in foster care, 7.1% were in residential treatment, and 4.0% had another living situation. The

sample had a mean of 3.9 overall trauma exposures (SD= 2.42, minimum= 1, maximum= 14) and a mean of 1.1 maltreatment exposures (SD= 1.28, minimum= 0, maximum= 4).

PTSD, Dissociation, and Dissociative Subtype Groups

The overall rate of PTSD for this sample was 23.8%, and the overall rate of dissociation (as defined by the *DSM-5* subtype of PTSD) was 23.2%. Among the PTSD cases, 53.7% endorsed dissociation. The group proportions are shown in Table 1.

[Insert Table 1]

Demographics

Chi-square tests and ANOVA tests with pairwise follow-up tests were used to examine group differences for demographic variables (see Table 2). The PTSD-D group and PTSD-only group had a higher proportion of females than males (75.1% and 75% female, respectively) compared with the dissociation-only group (59.5% female). The PTSD-D group also had higher proportions of adolescents in residential treatment than either of the other groups (11.7%, 10.0%, 3.4%, respectively). There were no statistically significant differences by race. Differences in age by group were minimal; the only statistically significant difference was slightly older age for the PTSD-only group compared with the dissociation-only group (difference= 0.5 years, $p < .001$).

[Insert Table 2]

Trauma History and Psychopathology Symptoms.

There were statistically significant differences between the four groups for all trauma variables except neglect. The PTSD-only and PTSD-D groups had higher proportions of adolescents with each trauma exposure and early childhood trauma exposure than the dissociation-only group (see Table 3). The PTSD-only group had more overall trauma exposures (difference = 0.738, $p < .001$) and more maltreatment trauma exposures (difference= 0.375, $p <$

.001) than the dissociation-only group. In comparing the PTSD-only and the PTSD-D groups, the only statistically significant difference was that the PTSD-only group had slightly more maltreatment trauma exposures than the PTSD-D group (difference= 0.271, $p = .02$).

The four groups also differed significantly on PTSD symptom count, dissociation symptom count, and internalizing/externalizing behavior symptom counts. The PTSD-D group had more PTSD symptoms than the PTSD-only group (difference= 0.9, $p = .008$) and more dissociation symptoms than the dissociation-only group (difference= 1.6, $p < .001$). The dissociation-only group had fewer internalizing behavior symptoms than the PTSD-D group (difference= 3.0, $p = 0.01$). All other pairwise differences were not statistically significant or were only significant when being compared to the reference group.

[Insert Table 3]

Predictors of PTSD/Dissociation Group

In this model, the ‘neither’ group (i.e., adolescents with trauma exposure but who did not meet *DSM-5* criteria for PTSD or dissociation) was the reference group. The multinomial logistic regression model indicated that maltreatment slightly increased the odds of membership in the three psychopathology groups over the reference group (PTSD-only: OR= 1.29; dissociation-only: OR= 1.17; PTSD-D: OR= 1.12). The odds of membership in the PTSD-only group and the PTSD-D group were higher for females (OR= 2.24 and OR=2.26, respectively). The dissociation-only group had lower odds of public insurance status (OR= 0.60) and living at a residential treatment center (OR= 0.47) compared to the reference group. The PTSD-D group had higher odds of living at a residential treatment center (OR= 1.53).

Discussion

This descriptive study aimed to characterize PTSD, dissociation, and PTSD-D among adolescents exposed to maltreatment. Using a clinical sample of treatment-seeking adolescents, the study found a high prevalence of PTSD-D (53.7%). Adolescents with PTSD-D were more likely to be female and to be living in residential treatment than other groups, and maltreatment increased the odds of having PTSD, dissociation, or both. All PTSD-affected adolescents, with or without the dissociative subtype of PTSD, had more overall trauma exposures and maltreatment trauma exposures than those without a PTSD diagnosis. The differences between the two PTSD groups on PTSD symptoms were minimal, but the PTSD-D group had more dissociation symptoms than any other group. The dissociation-only group had few PTSD symptoms while the PTSD-D group was quite similar to PTSD-only, suggesting that dissociation in combination with PTSD may involve particularly severe depersonalization and derealization.

The finding in this study that 53.7% of adolescent PTSD cases had the dissociative subtype is notably higher than the prevalence of PTSD-D among adults. Adult prevalence estimates range from 14.4% in the World Mental Health Survey, to 12-13% in a study of military veterans, to 30% in a study of female military veterans with high rates of exposure to sexual trauma (Armour, Karstoft, & Richardson, 2014; Stein et al., 2013; Wolf et al., 2012a; Wolf et al., 2012b). Although it is not possible to directly compare these estimates due to differences in the characteristics of the populations studied in addition to age (e.g., military veterans versus civilians, community sample versus clinical sample), trends in research to date and the results of this study support existing literature about the prominence of dissociative coping in the face of maltreatment across childhood (Liotti, 2004; Putnam, 1997). Children and adolescents do not have the same capacity as adults to escape or avoid traumatic stressors when they originate in the

home environment or with caregivers. In these cases, dissociation may be their only option for coping. This explanation of dissociation as a coping mechanism developed in response to child maltreatment and the findings of this study of adolescents agree with adult studies of the dissociative subtype of PTSD, where adults with the subtype have experienced more maltreatment and multiple or repeated episodes of maltreatment (Lanius et al., 2012; Wolf et al., 2012b). However, this study cannot conclusively determine an explanation for the high proportion of dissociative subtype cases, and it is possible that this finding was due to the treatment-seeking, clinical nature of the sample.

Overall, the PTSD-D group was very similar to the PTSD-only group, except somewhat more symptomatic across all psychopathology measures despite reporting fewer types of maltreatment. One possible explanation for the similarity between the PTSD-D and PTSD-only groups is that the dissociation symptoms of depersonalization and derealization capture a less specific portion of cases of dissociation co-occurring with PTSD than these dissociation symptoms would in an adult population. Other dimensions of posttraumatic dissociation have been identified among adolescents, including amnesia and loss of conscious control in addition to depersonalization/derealization, and it is possible that what youth rate as depersonalization/derealization may be emotional numbing rather than dissociation. (Kerig et al., 2016). Given the limited amount of study on PTSD-D among adolescents and that PTSD can intensify or exacerbate dissociation symptoms, additional research is needed exploring the co-occurrence of PTSD and a broader range of dissociation symptoms (Ford, 1999). Another possible explanation is that dissociation is attenuating distress—that is, continuing to function as a psychological escape mechanism when there is no other escape—or ability to recall trauma, thereby obscuring symptoms and number of reported trauma exposures (Seng, D’Andrea, &

Ford, 2014; van der Kolk & Fisler, 1995). However, the current study does not allow for exploration of this mechanism and additional research would be needed.

The final psychopathology group, dissociation-only without PTSD, had higher mean scores than the reference group for all the symptom variables, and comparable externalizing problems—but fewer internalizing problems—than the PTSD-only group. This group was also less likely to have experienced sexual abuse, more likely to be living with parents, less likely to be receiving public insurance than either of the PTSD-groups, and did not have the same preponderance of females as other groups. Although these data alone do not allow for definitive conclusions about this group to be drawn and further research is needed, the findings may suggest that the dissociation-only group represents maltreated youth with more stable family environments who appear to have less severe internalizing problems than the PTSD youth. They also may not have reached diagnostic thresholds for PTSD because adolescents in this group had fewer trauma exposures.

This study has several strengths and limitations that should be taken into account in understanding and interpreting the results. The study used a large, diverse clinical sample with valid reliable measures. The findings of the study support existing literature and contribute to the growing evidence base on traumatic stress and dissociation among adolescents. There are some limitations to this study as well. The study used a *DSM-IV* measure of PTSD due to constraints of the dataset and a self-report measure of dissociation. This study used a treatment-seeking, clinical sample of trauma-exposed adolescents in the US, and as such, the results of this study are only generalizable to that population. The CDS sample was disproportionately more female than male and had low numbers of older (17- and 18-year-old) adolescents, which resulted in a sample ages 12 to 16 only. The TSCC-A, used at NCTSN clinical sites, is only valid for

adolescents aged 12-16 and explains the low number of older adolescents. Demographic trends of child abuse and neglect cases in the US indicate that (1) girls experience maltreatment at higher rates than boys, and (2) the highest number of maltreatment cases occur for children less than one year of age, and then incrementally decrease from age one to age seventeen (DHHS, 2016). Overall, these trends held true for the sample, and the fact that the ratio of females to males was slightly higher in this study than what child abuse and neglect reports indicate may be due to the broad range of types of trauma exposures youth seeking NCTSN services experienced, beyond just abuse and neglect. There were not sufficient data present in the CDS and/or the CDS did not assess additional socioeconomic status indicators (e.g., family income, parent education), and as such, insurance status was the only available indicator of socioeconomic risk. We took a conservative approach to handling missing data on trauma exposures and symptoms, and thus trauma exposures and symptoms not recorded by the clinician during the intake process were assumed to be not present. Nevertheless, it is possible that some exposures or symptoms were not reported or recorded for other reasons but actually were present. A self-report measure of dissociation was used, and dissociation is a difficult phenomenon for youth to conceptualize and report. Additionally, only two dissociation items were used to examine the *DSM-5* dissociative subtype of PTSD, and these two items alone may not have been sensitive for capturing all dissociative adolescents. However, prior studies of adolescent dissociation have demonstrated good reliability and validity of self-report measures (Armstrong et al, 1997). Additionally, this study did not include adolescents older than age 16. Although it would have been optimal to include older adolescents ages 17 and 18 as well to close the gap in knowledge from age 12 through adulthood, there were only 39 adolescents ages 17 or 18 (1% of the sample) meeting inclusion criteria for the study. This small group of adolescents did not differ from middle

adolescents on any key measures and was not large enough to make developmental comparisons. Although the age range of 12 to 16 years has some limitations, this age range was consistent with the dissociation outcome measure, the TSCC-A, which is designed to be used with children up to age 16. Consistent with prior studies attempting to use this measure with children over the age of 16, the 17- and 18-year-old group demonstrated poor internal consistency reliability compared with younger and middle adolescents.

Conclusion

Literature on the dissociative subtype of PTSD among adolescents has begun to emerge since the addition of the subtype to the *DSM-5* in 2013, and this study contributes to the evidence base by characterizing PTSD, dissociation, and PTSD-D in a clinical sample of treatment-seeking adolescents from the NCTSN. PTSD and dissociation appear to frequently co-occur in adolescents exposed to maltreatment and at much higher rates than adults. Further research is needed to explore mechanisms of distress intolerance, affect dysregulation, and expression of a broader range of dissociative symptoms with PTSD, including dissociative amnesia, to further understand how to diagnosis and treat traumatic stress disorders among adolescents.

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Table 12: PTSD and Dissociation Group Proportions

	Dissociation No n(%)	Dissociation Yes n(%)
PTSD No	2026 (65.76)	321 (10.42)
PTSD Yes	340 (11.04)	394 (12.79)

Table 13: PTSD and Dissociation Group Comparison on Demographic Characteristics

N (%)	Overall 3081 (100.0)	PTSD 340 (11.0)	Depersonalization / Derealization 321 (10.4)	PTSD-D 394 (12.8)	Neither 2026 (65.8)	⁺ X ² / ⁺⁺ F
Gender and Race						
Age (years) M(SD)	14.5 (1.45)	14.8 (1.46)	14.32 (1.41)	14.62 (1.44)	14.46 (1.45)	8.04 ⁺⁺ *
Female gender	1863 (60.5)	255 (75.0)	191 (59.5)	296 (75.1)	1121 (55.3)	87.95 ⁺⁺ *
White	998 (32.4)	114 (33.5)	107 (33.3)	132 (33.5)	645 (31.8)	0.86 ⁺
Black	705 (22.9)	85 (25.0)	79 (24.6)	85 (21.6)	456 (22.5)	1.93 ⁺
Hispanic	1136 (36.9)	114 (33.5)	108 (33.6)	145 (36.8)	769 (38.0)	4.18 ⁺
Other	184 (6.0)	20 (5.9)	20 (6.2)	24 (6.1)	118 (5.8)	0.52 ⁺
Residence						
Parents	1925 (62.5)	201 (59.1)	217 (67.6)	243 (61.7)	1264 (62.4)	6.83 ⁺
Relatives	364 (11.8)	41 (12.1)	41 (12.8)	38 (9.6)	244 (12.0)	2.37 ⁺
Foster care	275 (8.9)	40 (11.8)	25 (7.8)	34 (8.6)	176 (8.7)	3.66 ⁺
Residential treatment	218 (7.1)	34 (10.0)	11 (3.4)	46 (11.7)	127 (6.3)	24.70 ⁺⁺ *
Other	122 (4.0)	11 (3.2)	12 (3.7)	14 (3.6)	85 (4.2)	1.21 ⁺
Insurance						
None	811 (26.3)	86 (25.3)	87 (27.1)	99 (25.1)	539 (26.6)	0.66 ⁺
Private	351 (11.4)	33 (9.7)	52 (16.2)	53 (13.5)	213 (10.5)	11.51 ⁺⁺ *
Public	1885 (61.2)	218 (64.1)	179 (55.8)	237 (60.2)	1251 (61.7)	5.65 ⁺
Both	34 (1.1)	3 (1.0)	3 (1.0)	5 (1.2)	23 (1.1)	0.35 ⁺

*Value is significant at the 0.05 level.

**Value is significant at the 0.01 level.

Table 14: PTSD and Dissociation Group Comparison on Trauma and Psychopathology

N (%)	Overall 3081 (100.0)	PTSD 340 (11.0)	Depersonalization/ Derealization 321 (10.4)	PTSD- D 394 (12.8)	Neither 2026 (65.8)	⁺ X ² / ⁺⁺ F
Trauma History						
Trauma before age 6	906 (29.4)	129 (37.9)	93 (29.0)	127 (32.2)	557 (27.5)	17.05 ⁺⁺⁺
Sexual abuse	797 (25.9)	130 (38.2)	74 (23.1)	122 (31.0)	471 (23.3)	38.25 ⁺⁺⁺
Physical Abuse	1037 (33.7)	154 (45.3)	106 (33.0)	152 (38.6)	625 (30.8)	31.64 ⁺⁺⁺
Emotional abuse	1337 (43.4)	187 (55.0)	157 (48.9)	189 (48.0)	804 (39.7)	35.96 ⁺⁺⁺
Neglect	816 (26.5)	99 (29.1)	88 (27.4)	100 (25.4)	529 (26.1)	1.88 ⁺
Trauma count M(SD)	3.85 (2.42)	4.68 (2.72)	3.94 (2.52)	4.34 (2.67)	3.6 (2.25)	26.50 ⁺⁺⁺
Maltreatment count M(SD)	1.14 (1.28)	1.55 (1.36)	1.18 (1.28)	1.28 (1.34)	1.04 (1.23)	17.77 ⁺⁺⁺
Psychopathology						
PTSD Symptom count M(SD)	8.41 (5.39)	14.98 (2.33)	9.04 (3.48)	15.87 (2.22)	5.8 (3.96)	1199.00 ⁺⁺⁺
Dissociation symptom count M(SD)	2.29 (2.38)	2.69 (1.70)	4.43 (1.99)	6.05 (2.09)	1.16 (1.36)	1284.00 ⁺⁺⁺
Externalizing behavior M(SD)	62.4 (11.94)	63.36 (12.18)	63.09 (12.03)	64.78 (11.32)	61.66 (11.92)	7.79 ⁺⁺⁺
Internalizing behavior M(SD)	62.4 (12.21)	65.52 (12.08)	63.86 (11.32)	66.83 (11.58)	60.78 (12.05)	34.89 ⁺⁺⁺

*Value is significant at the 0.05 level.

**Value is significant at the 0.01 level.

Table 15: Multinomial Logistic Regression Model

Outcome (ref= Neither)	PTSD Only		Depersonalization/Derealization Only		PTSD-D	
	OR	95% CI	OR	95% CI	OR	95% CI
Maltreatment						
Number	1.29**	1.15-1.43	1.17**	1.04-1.31	1.12*	1.01-1.24
Age of trauma (ref= After 6 yo)						
Before 6yo	1.08	0.81-1.45	0.87	0.64-1.19	1.02	0.77-1.36
Gender (ref= male)						
Female	2.24**	1.71-2.94	1.14	0.89-1.47	2.26**	1.75-2.91
Race (ref=white)						
Black	1.35	0.98-1.87	1.18	0.84-1.65	1.10	0.80-1.52
Hispanic	0.99	0.73-1.34	0.97	0.71-1.31	1.12	0.85-1.48
Other	0.96	0.56-1.64	1.18	0.71-1.95	1.01	0.62-1.65
Insurance (ref= private)						
None	1.01	0.64-1.61	0.69	0.46-1.05	0.79	0.53-1.19
Public	0.94	0.62-1.43	0.60*	0.41-0.86	0.73	0.51-1.05
Both	0.74	0.20-2.73	0.64	0.18-2.28	0.91	0.32-2.61
Residence (ref= parents)						
Relatives	0.86	0.59-1.26	0.97	0.67-1.42	0.77	0.52-1.13
Foster care	1.00	0.66-1.51	0.81	0.50-1.30	0.94	0.62-1.45
Residential Treatment	1.10	0.71-1.71	0.47*	0.25-0.90	1.53*	1.04-2.27
Other	0.65	0.34-1.26	0.80	0.43-1.51	0.79	0.44-1.43

*Value is significant at 0.05 level.

**Value is significant at 0.01 level.

CHAPTER 3: Service usage typologies in a clinical sample of trauma-exposed adolescents:

A latent class analysis

Abstract

Objective: The purpose of this study is to describe typologies of service usage among trauma-exposed adolescents and to examine associations between trauma, psychopathology, demographics, and trauma-related service usage using a sample from the National Child Traumatic Stress Network (NCTSN).

Method: Latent class analysis was used to derive a model of service use typologies based on ten service variables using a sample of 3,081 trauma-exposed adolescents ages 12 to 16. Services used 30 days prior to the initial assessment from five sectors were examined (health care, mental health, school, social services, and juvenile justice).

Results: A five-class model was selected based on statistical fit indices and substantive evaluation of classes: (1) High intensity/multi-system, 9.5%; (2) Justice-involved, 7.2%; (3) School and mental health, 19.9%; (4) Social service and mental health, 19.9%; and (5) Low service usage/Reference, 43.5%. Class 1 had the highest overall trauma exposure count ($M = 5.1$, $SD = 2.9$), followed by class 4 ($M = 4.4$, $SD = 2.5$), and then class 2 ($M = 4.2$, $SD = 2.7$). None of the group differences for PTSD or dissociation symptom count were statistically significant predictors of class membership.

Conclusions: This study provides new evidence about patterns of service utilization by trauma exposed, service seeking adolescents. Most of these adolescents appear to be involved with at

least two service systems prior to seeking trauma treatment services. Overall, maltreatment and other trauma exposures were associated with group differences in service utilization pattern complexity, but trauma-related psychopathology was not.

Introduction

Child maltreatment and other adverse childhood experiences lead to chronic mental and physical health disorders and increased health risk behaviors during childhood and across the lifespan (Felitti et al., 1998). In addition to high chronic disease burden, individuals who were abused or neglected have more involvement with child welfare services and the juvenile justice system, as children, and higher rates of sexual assault and domestic violence victimization, homelessness, and criminality, as adults (Ford et al., 2010; Hetzel & McCrane, 2005; Spatz, 1989; Stein, Leslie, & Nyamathi, 2002). Considering the lifelong impact of chronic illness treatment and service utilization—defined as usage of any “services dealing with the diagnosis and treatment of disease, or the promotion, maintenance and restoration of health” (World Health Organization [WHO], n.d.)—the cost of abuse and neglect to society is estimated to be over \$100 billion per year (Gelles & Perlman, 2012; Wang & Holton, 2007). Although the links between (1) child maltreatment and health disorders, and (2) health disorders and service utilization, are known, relationships among all three of these factors focused specifically on trauma-related disorders, such as posttraumatic stress disorder (PTSD) and dissociative disorders, and trauma-related service utilization have not been widely studied (American Psychiatric Association [APA], 2013).

Research reports suggest that adults with PTSD have high rates of service usage and associated higher costs (Greenberg et al., 1999). The literature on service usage by children and adolescents is mixed with some prior studies suggesting high rates of service usage and others

suggesting under-utilization (Briggs et al., 2013; Burns et al., 2004; Cole et al., 2016). Between 2007 and 2010, children increased their overall usage of behavioral health services by 24% and usage of psychotropic medications by 10% (Health Care Cost Institute [HCCI], 2012), but despite this apparent overall increase in service utilization, the few existing studies of service utilization specific to trauma-exposed children suggest under-utilization. In a large prospective cohort study of mental health service needs and usage among child welfare-involved youth, approximately half of the sample had a clinically significant emotional or behavioral problem warranting mental health services (Burns et al., 2004). However, only one-quarter of those children had received mental health services during the year prior to participating in the study (Burns et al., 2004). Neglected children and youth residing at home were especially unlikely to receive needed mental health services, and other studies have found similar patterns of unmet mental health service needs among groups of children living in rural areas (Heflinger et al., 2015). In contrast to studies of adults with PTSD where high rates of service utilization are a concern, these studies of youth with trauma exposure suggest that under-utilization may be a concern and indicate a need for system-level research to improve structures of care and facilitate access, utilization, and ultimately, outcomes (Tuerk et al., 2013). While clarifying patterns of service utilization among youth generally is a needed area of research, it is important to understand developmental differences in service utilization across the lifespan, and as such, patterns should be considered separately for each developmental stage. It may be particularly useful to first consider adolescents, who are transitioning from childhood to adulthood, to seek clarity in service utilization patterns among youth and build a bridge for future study of younger children. During adolescence, children begin to show increasing independence from their parents, experience mood fluctuations, increase their capacity for complex thought and

emotional expression, and often highly value peer relationships (Centers for Disease Control [CDC], n.d.). These developmental characteristics are likely to influence patterns of service utilization in that adolescents have increased capacity for involvement and agency in decision making and help seeking related to their health, but still require parental involvement and guidance. Defining and understanding patterns of service usage by adolescents in a multi-agency system of care is an important first step to illuminating dimensions of service usage and informing optimal system organization (Burns & Friedman, 1990).

Even when adolescents with exposure to maltreatment and their families do access trauma treatment services, delivering evidence-based interventions can be challenging, and service systems do not always accommodate the complex biopsychosocial needs of the adolescent and family across development. System deficiencies often result in the placement of youth in psychiatric hospitals or residential treatment centers, which are expensive and do not advance national goals of providing professional services in the community rather than in institutions (Burns & Friedman, 1990; Institute of Medicine [IOM], 2009). Understanding patterns of service usage for adolescent populations also has potential to influence service delivery models to be more trauma-informed. *Trauma-informed care*, a paradigm for approaching service delivery that takes trauma history into account, is not well understood in all service sectors and is not always a priority for providers, agencies, and systems, although much evidence exists suggesting that trauma has a profound impact on how people access and use professional services and cope with life stressors (Dallam, 2010; Substance Abuse and Mental Health Services Administration [SAMHSA], n.d.). The Substance Abuse and Mental Health Services Administration (SAMHSA) has listed trauma-informed care as a core competency for service professionals, and understanding service utilization patterns for adolescents with histories

of trauma is an important first step in achieving system-level change for better trauma-informed service delivery (SAMHSA, n.d.).

Examining relationships between trauma, trauma-related psychopathology, and service usage patterns has the potential to clarify how trauma-exposed adolescents are using systems of care and which components of care systems are being accessed. By understanding service utilization patterns among youth with trauma exposure and trauma-related mental illness, service delivery systems can be designed to reflect changing needs across the lifespan and ensure that individuals receive needed mental health services.

The study described in this paper focuses specifically on adolescents to address the gap in knowledge of what happens during the adolescent years when individuals with a trauma history move from a general pattern of under-utilization in childhood to over-utilization as adults. The purpose of this study was to describe typologies of trauma-related service usage among trauma-exposed adolescents and to examine associations between trauma, psychopathology, demographics, and service usage using a treatment-seeking sample from the National Child Traumatic Stress Network (NCTSN).

Methods

Design, Data, and Sample

This descriptive study used data from the NCTSN Core Data Set (CDS) in a secondary analysis. The NCTSN, established by Congress in 2000, is collaborative network of clinicians, researchers, and families across the United States focused on addressing child traumatic stress by raising the standard of care for child trauma and improving access to evidence-based services (National Child Traumatic Stress Network [NCTSN], 2009; Steinberg et al., 2014). From 2004 to 2010, as part of a quality improvement initiative, NCTSN compiled the CDS containing

14,088 trauma-exposed children ages 0 to 21 with data on trauma history, mental health, functional status, service utilization, and treatment (NCTSN, 2009; Steinberg et al., 2014). The CDS was selected for the current study as it contains a large, diverse sample with detailed data about trauma history characteristics, mental health, and service utilization. A subset of the full NCTSN sample was selected to include adolescents ages 12 to 16 who had at least one trauma exposure (n= 3081). This age range was selected to capture the early and middle adolescent developmental stage in examining trauma-related psychopathology and patterns of service usage. Cases missing all data on either PTSD or dissociation, the two trauma-related psychopathology variables of interest for this study, were listwise-deleted from the sample.

Measures

Demographics. Standard sociodemographic variables were examined to describe the sample, including gender, race, age, place of residence, and insurance status. Gender categories were male or female. Racial categories were White, Black, Hispanic, and Other. Place of residence categories with parents, with other relatives, foster care, residential treatment, and other. Insurance status (public versus private) was used as a proxy variable for socioeconomic disadvantage, consistent with prior studies using the CDS (Briggs et al., 2012; Greeson et al., 2011; Greeson et al., 2014; Kiser et al., 2014).

Trauma History. The CDS General Trauma Information Form contains data on trauma exposure history and characteristics. This form was created for the CDS based on the Trauma History Profile (THP) in the UCLA Posttraumatic Stress Disorder Reaction Index (UCLA PTSD-RI) (Steinberg et al., 2004). Clinicians interviewed the child and his or her caregiver to assess for 20 possible trauma exposures and the age when the trauma exposure occurred. In this study, we examined four maltreatment variables (physical abuse, sexual abuse, emotional abuse,

and neglect), the age when maltreatment exposure occurred (before age 6 or after age 6), a count of the overall number of trauma exposures (1-20), and a count of the overall number of maltreatment trauma exposures (0-4).

Service utilization. Service utilization was measured using the Baseline Assessment Form from the CDS. This form asks clinicians to indicate which of nineteen different trauma-related services the child has received in the past 30 days, including at the center where the child is presenting for services and other services in related or non-related sectors with the responses ‘Yes,’ ‘No,’ or ‘Unknown.’ The services include inpatient psychiatric unit or hospital for a mental health problem, residential treatment center, detention center/training school/jail/prison, group home, treatment foster care, probation officer/court counselor, day treatment program, case management/care coordination, in-home counseling, outpatient therapy, outpatient treatment from a psychiatrist, primary care physician/pediatrician for symptoms related to trauma or emotional/behavioral problems, school counselor/school psychologist/school social worker, special class/special school, child welfare/Department of Social Services, foster care, therapeutic recreation services/mentor, hospital emergency room, and self-help groups. For improved model parsimony, these service variables were collapsed into 10 variables reflecting service intensity and service sector as follows:

[Insert Table 1]

PTSD. The ULCA PTSD-RI for *DSM-IV* was used to measure PTSD (Elhai et al., 2013; Steinberg et al., 2004; Steinberg et al., 2013). This measure is a 48-item measure can be administered in self-report or interview format. The portion used in the CDS includes 22 items assessing three *DSM-IV* symptom clusters (intrusive re-experiencing, avoidance/numbing, and hyper-arousal) and two associated features of PTSD, trauma-related guilt and fear of trauma

recurrence (Elhai et al., 2013; Steinberg et al., 2013). Symptoms were considered present for scores of 2 or greater. The items on the UCLA-PTSD-RI correspond to the *DSM-IV* PTSD symptom clusters and allow for a PTSD diagnosis based on whether or not the the *DSM-IV* criteria for the disorder are met (at least one B cluster item, at least three C cluster items, and at least two D cluster items; this diagnosis did not consider level of functional impairment) (APA, 2000). The internal consistency reliability on the UCLA PTSD-RI for this sample was 0.93.

Dissociation. Dissociation was measured using two items from the dissociation subscale of the Trauma Symptom Checklist for Children-Alternate Version (TSCC-A), a 44-item measure of traumatic stress symptoms designed for children ages 8 to 16 years (Briere, 1996).

Dissociation was defined for this study according to the *DSM-5* diagnostic criteria for the dissociative subtype of PTSD, and thus we included only the two symptoms described in the *DSM-5*, depersonalization and derealization (APA, 2013). These symptoms were considered present for scores of 2 or higher on a 0 (never) to 3 (almost all of the time) scale. The overall internal consistency reliability for the TSCC-A was 0.97 and 0.69 for the two dissociation items.

Behavioral symptoms. The Child Behavior Checklist (CBCL) is a 112-item measure of emotional and behavioral problems among children ages 6 to 18 (Achenbach, 1991; Achenbach & Rescorla, 2001). Items are reported on 3-point Likert scales (0/Not true, 2/Very true or often true). This study used t-scores from the internalizing and externalizing behavior broadband scales of the CBCL. The t-scores are standardized scores are based normative samples by age and gender, where 50 is the mean score with a standard deviation of 10 for each age group (6–10 years, 11–18 years) and gender (girls, boys) group (Achenbach, 1991). Scores higher than 63 indicate clinically significant levels of behavioral problems (normal scores are below 60; scores

of 60 to 63 are considered borderline) (Achenbach & Rescorla, 2001). The internal consistency reliability was 0.90 for the internalizing subscale and 0.92 for the externalizing subscale.

Procedure

The NCTSN Publication Review Committee (PRC) reviewed and approved the study. The University of Michigan Institutional Review Board approved this study. A data use agreement was arranged between the University of Michigan and Duke University School of Medicine. The analysis was conducted at the National Center for Child Traumatic Stress at the Duke University School of Medicine.

All analyses were conducted in R, version 3.2.3, and Mplus. As described previously, cases missing all data on either PTSD or dissociation were omitted from the sample. There were no distinguishable patterns of missingness for other variables and item-level data were missing in low proportions (less than 10%), and these missing data were coded as ‘no’ responses (i.e., if the clinician did not record the symptom or trauma exposure, that item was assumed to be absent) (Low, Seng, & Miller, 2008). First, frequencies and descriptive statistics were examined for all variables used in the analysis.

Latent class analysis (LCA) was used to derive service usage typologies. Latent class analysis is a statistical technique used to identify unobserved (latent) heterogeneity in a population from categorical data (McCutcheon, 1987). The 10 service usage variables reflecting service sector and service intensity were entered into the model. Initially, a 2-class model was estimated. Then, the number of latent classes was incrementally increased, comparing the fit of each new model to the previous model. Several statistical fit indices were used to compare models and select the most parsimonious model that fit the data best, including Bayesian information criterion (BIC), sample-size adjusted Bayesian information criterion (SSABIC)

Akaike information criterion (AIC), and the Vuong-Lo-Mendel-Rubin (VLMR) likelihood ratio test (Nylund, Asparouhov, & Muthén, 2007). Lower BIC or AIC values indicate that the model fit is improved by adding a class. The VMLR likelihood ratio test compares a model with k classes to a model with $k + 1$ classes. It generates a test statistic and p-value, and if the p-value is less than .05, the model fit is improved by adding a class. To determine the quality of the latent classes, entropy values and substantively meaningful characteristics of the classes were assessed by the investigators. Entropy values range from 0 to 1, and values closer to 1 indicate better differentiation and separation between classes (Asparouhov & Muthén, 2014).

After selecting the best-fit latent class model and assigning cases in the sample to their most likely latent classes, chi-square tests and ANOVA tests with pairwise follow up tests were used to examine differences in characteristics between latent classes for each of the two models. The sample was divided into four groups according to their trauma-related psychopathology to assess agreement between *DSM-5* diagnosis of the dissociative subtype and latent classes: (1) PTSD-only, (2) dissociation-only, (3) both PTSD and dissociation, which represents the dissociative subtype of PTSD (PTSD-D), and (4) neither (APA, 2013). A multinomial logistic regression model was estimated to examine associations between demographic variables, trauma history variables, psychopathology, and service usage typology. The PTSD/dissociation categorical grouping variable was the predictor variable (the ‘neither’ group was the reference category), with covariates for age, gender, race, insurance type, primary residence, number of trauma exposures, type of trauma exposure, and age of trauma exposure.

Results

Sample

The mean age of the sample was 14.5 years ($SD= 1.45$). The sample was 60.5% female and 39.5% male. The ethnic/racial proportions of the sample were 32.4% white, 22.9% black, 36.9% Hispanic, and 6.0% other. Public insurance status was considered a proxy variable for socioeconomic risk, and 61.2% of the sample had public insurance. Sixty-two percent of the sample resided with their parents, while 11.8% were living with other relatives, 8.9% were in foster care, 7.1% were in residential treatment, and 4.0% had another living situation. The sample had a mean of 3.9 overall trauma exposures ($SD= 2.42$) and a mean of 1.1 maltreatment exposures ($SD= 1.28$).

Model Selection

After evaluating several fit indices and model quality both statistically and substantively, a 5-class model was selected as the best fit for the data (Table 2).

[Insert Table 2]

This model was favored by the BIC, the VLMR likelihood ratio test, and the adjusted LMR likelihood ratio test. In addition and most importantly, the classes in this model were substantively meaningful. The 5-class model classified 9.5% of the sample in group 1, 7.2% in group 2, 19.9% in group 3, 19.9% in group 4, and 43.5% in group 5.

Description of Latent Classes

Figure 1 shows the profiles of the 5 latent classes. Class 1 (High intensity/multi-system) was characterized by usage of intensive mental health services and school services, as well as lower-intensity social service and healthcare services. Class 2 (Justice-involved) had the highest probabilities of both high- and low-intensity justice service usage of any group, and these probabilities were higher than other types of service usage within the class. Class 3 (Low intensity/multi-system) used low-intensity services across multiple systems, including mental

health, school, and healthcare. Class 4 (Social service and mental health) was similar to class 3 in using multiple low-intensity services, but this class was characterized by high probability of mental health and social service usage. Class 5 (Low service usage/Reference) had very low probabilities of service usage across all systems.

[Insert Figure 1]

Comparison of Latent Classes

Demographics. Class 2 (Justice-involved) was the oldest group (mean age= 15.34, SD=1.17) and was significantly older than the other four groups. Class 1 (High intensity/multi system) was the second oldest group (mean age= 14.93, SD= 1.38), and although the age difference was also statistically significant when comparing class 1 to each of the other classes, all classes except class 2 were 14 years of age. There was a higher proportion of males than females in class 2 (54.7% male, 45.3% female), while class 1 and class 4 had more females than males (57.5% and 71.9%, respectively). The classes differed significantly with respect to race; notably, there were large proportions of Hispanic adolescents in the low service usage/reference class (50.5%). The effect sizes (Cohen's w) for membership in the low service utilization class related to demographic characteristics were as follows: white race, 0.27 (small), black race, 0.13 (small), public insurance status, 0.18 (small), and Hispanic race, 0.34 (medium). The highest proportions of adolescents living in residential treatment were in class 1 (29.8%), class 2 (17.9%), and class 4 (11.1%). Class 4 had the highest proportion of adolescents living in foster care (28.5%). For insurance status, 63.7% of adolescents in class 1 and 76.3% of adolescents in class 4 were using public insurance. Examining service usage count, class 1 had the highest count number (mean= 7.33, SD=2.05) which was significantly higher than the service count for

all other groups. Class 4 had a mean usage of 3.92 services (SD= 1.53) and class 2 had a mean usage of 3.45 services (SD= 1.59).

[Insert Table 3]

Trauma History and Psychopathology Symptoms. For all maltreatment types and age of maltreatment, the largest proportions of adolescents with exposure to each individual trauma and trauma exposure before age 6 fell into class 1 and class 4. Class 1 had the highest overall trauma count (mean= 5.09, SD= 2.85) and maltreatment count (mean= 1.86, SD= 1.48), followed by class 4 (mean count= 4.44, SD= 2.48; mean maltreatment count= 1.66; SD= 1.4) and class 2 (mean count= 4.15, SD= 2.66; mean maltreatment count= 1.06; SD= 1.25). For overall trauma count, the difference between class 1 and class 2 was statistically significant (mean difference= 0.941, $p < .001$) and the difference between class 1 and class 4 was statistically significant (mean difference= 0.651, $p = .001$), but class 2 and class 4 did not differ significantly from each other. For maltreatment trauma count, the difference between class 1 and class 2 was statistically significant (mean difference= 0.801, $p < .001$) and the difference between class 2 and class 4 was statistically significant (mean difference= 0.594, $p < .001$), but class 1 and class 4 did not differ significantly from each other.

The only statistically significant difference in PTSD symptom count was between class 1 and class 5 (mean difference= 1.423, $p = .002$); none of the other pairwise group comparisons were statistically significant. Class 1 had the highest mean number of PTSD symptoms (mean= 9.5, SD= 5.31) and class 5 had the lowest (mean= 8.08, SD= 5.36). There were no statistically significant group differences on dissociation symptom count between any group pairings.

For externalizing behavioral symptoms, class 1 differed from class 4 by a mean of 3.9 more symptoms ($p < .001$). Classes 2 and 3 also had more symptoms than class 4 (class 2 mean

difference= 3.0, $p= 0.030$; class 3 mean difference= 2.1; $p= 0.04$). Class 1 had the highest number of externalizing behavior symptoms (mean= 66.18, SD= 11.23). There were no other statistically significant group differences with respect to externalizing behavior symptom count except in comparison to class 5, the reference class. Class 3 had the highest number of internalizing behavior symptoms (mean= 64.18, SD= 11.8) and had significantly more internalizing behavior symptoms than class 4 (mean difference= 2.6, $p= .006$). There were no other statistically significant differences for internalizing behavior symptom count, excluding significant differences in comparison to the reference class.

[Insert Table 4]

Predictors of Service Usage Typologies

In this model, class 5 was the reference group. The multinomial logistic regression model indicated that dissociation-only decreased the odds of being in class 4 (OR= 0.63, 95% CI= 0.43-0.92). Additionally, the dissociative subtype decreased the odds of being in class 2 (OR= 0.004, 95% CI= 0.004-0.004). None of the other predictor groups were statistically significant.

[Insert Table 5]

Discussion

This study identified patterns of service utilization in a sample of trauma-exposed adolescents seeking treatment for issues related to trauma, and then examined associations between trauma, PTSD and dissociation, and service utilization patterns. This study provides new evidence about patterns and characteristics of service utilization by trauma exposed adolescents and builds on the existing literature about service utilization by trauma-exposed youth. Previous studies have described under-utilization or over-utilization, and this study provides more detailed information about the service utilization itself beyond its intensity or

frequency (Halfon, Berkowitz, & Klee, 1992; Heflinger et al., 2015; Ford et al., 2005; New & Berliner, 2000).

Most adolescents appear to be interacting with at least two service systems in the 30 days prior to receiving trauma treatment services. Overall, trauma history and sociodemographic factors contributed to group differences in pattern complexity, but psychopathology symptoms did not. Classes 1, 2, and 4 had the highest numbers of overall trauma exposures and maltreatment trauma exposures, but there were no significant differences between any of the groups on PTSD or dissociation symptoms. This finding is somewhat surprising; not all individuals who are exposed to trauma develop mental disorders like PTSD or dissociation, and it follows that the subset of trauma-exposed individuals who do develop pathological responses to trauma might be experiencing it as the most distressing and therefore would be the most likely to seek treatment. One possible explanation for this finding is that PTSD/dissociation diagnosis derived from the *DSM-IV* or *DSM-5* may not fully capture the symptoms and functional effects of the prolonged, severe interpersonal trauma exposure of maltreatment trauma explored in this study (APA, 2000; APA, 2013; Cloitre et al., 2009; D'Andrea et al., 2009; Herman, 1992; van der Kolk et al., 2009). Additionally, it is not unusual for symptomatic, trauma-exposed youth to fall short of the diagnostic threshold for PTSD. In this case, service utilization by adolescents experiencing functional impairment and trauma-related distress as a result of maltreatment might be better predicted by maltreatment itself rather than PTSD or dissociation diagnosis. It is also possible that other behavioral or emotional disorders not modeled in this study played a role in service-seeking. Maltreatment is associated with a wide range of other types of psychiatric morbidity besides just PTSD and dissociation, and service seeking could have been related to other symptom patterns or complex posttraumatic stress sequelae (Adams et al., 2016; Cecil et

al., 2017; Herman, 1992; Turner, Finkelhor, & Ormrod, 2006). This explanation aligns with the findings in this study that classes 1 and 2, which were high service usage classes, had high numbers of externalizing behavior symptoms.

In the multinomial model, dissociation alone and in combination with PTSD decreased the likelihood of having complex patterns of service utilization (class 4) and being involved with justice services (class 2). The literature on the relationship between service utilization and dissociation is mixed. One study found low rates of dissociation in justice-involved youth, but others have found high rates (Broksy & Lally, 2004; Carrion & Steiner, 2000). More evidence is needed to clarify this relationship between dissociation and service utilization. However, the findings of this study that suggest decreased service usage complexity might relate to dissociation in that dissociation services as a coping mechanism in the face of inescapable psychological trauma, like child maltreatment, that auto-attenuates distress and thus leads to less help-seeking (Lanius et al., 2014). It may also be the case that caregivers are more highly motivated to address externalizing and other disruptive behaviors, but not dissociation, which often goes unnoticed or is mistaken for inattentiveness.

Even in the specialized population of adolescents who are identified as traumatized and are receiving treatment for post-traumatic sequelae, there appear to be distinct sub-groups who are more likely than other traumatized youths to be receiving services from multiple systems (e.g., behavioral health, family/social services, school services, juvenile justice) (Ko et al., 2008). These multi-system-involved youths are more likely than other traumatized youths to be polyvictims and to have experienced maltreatment (D'Andrea et al., 2012; Finkelhor, Ormrod, & Turner., 2007; Ford et al., 2010). They also are more likely to come from economically disadvantaged families, consistent with the adverse effects of socioeconomic disadvantage

(Yoshikawa, Abor, & Bearsless, 2012). Some—particularly, but not exclusively, males—have become involved with juvenile justice, which may be a source of therapeutic and social services but which also can subject the youth and their families to additional adversities and potentially places them on a lifetime trajectory of problematic legal involvement (Feierman & Ford, 2016). Others may receive highly intensive—and often restrictive—mental health and school-based services (i.e., Class 1), which appears to be associated with especially high levels of externalizing behavior problems. They may also receive primarily only low-intensity services (i.e., Class 4) when their levels of externalizing and internalizing problems are relatively low, despite warranting treatment for posttraumatic stress.

Among youth characterized by multi-system involvement, those who were not involved with juvenile justice and were receiving primarily low-intensity services were particularly likely to be female (i.e., Class 4). This may reflect the generally greater propensity for boys to present with externalizing behavior problems or girls to present with dissociative problems (Leadbeater et al., 1999; Zona & Milan, 2011). Those problems tend to be used as markers for intensive or restrictive services, and they could lead to gender-based decisions about services that stigmatize youth perceived to be more troubled or troublesome and place them in restrictive settings (James et al., 2006). This also could potentially lead to insufficient intensity of services for girls or boys who have lower levels of externalizing and internalizing (including dissociative) symptoms, despite being comparably likely to have clinically significant PTSD symptoms as other traumatized youths, including those who receive intensive services. This study revealed some apparent racial disparities in service utilization. Hispanic adolescents were in the low service usage group at greater proportions than white or black adolescents or for adolescents in the public insurance (i.e., higher socioeconomic risk) group. This finding of lower service utilization

is consistent with previous studies of Hispanic youth (Bridges et al., 2010; Kataoka, Zhang, & Wells, 2002). Factors associated with Hispanic culture and values and factors associated with immigration may explain this finding. Hispanics may be more likely to conceptualize symptoms of mental illness as somatic rather than psychological in origin, and some studies have found lower rates of mental illness among Hispanic youth compared with other ethnoracial groups (Peifer, Hu, & Vega, 2000). Hispanic families may be more likely to seek spiritual support, traditional or folk healers, or other informal providers for mental disorder (Higginbotham, Trevino, & Ray, 1990). A final possible reason is that there may be real or perceived social and economic consequences to seeking mental health services for Hispanic families (e.g., social stigma, distrust of service providers, lack of insurance, fear of deportation or law enforcement involvement) (Lewis et al., 2005). Another unexpected finding related to race was that African American youth were under-represented in the justice-user class, which is inconsistent with prior studies that have found racial disparities in the juvenile justice system (Bishop & Frazier, 1988; Bishop & Frazier, 1996). This discrepancy may be because service utilization was only measured for the past 30 days, and it is possible that many of these youth had a history of juvenile justice involvement but just not recently. It also may indicate that justice-involved African American youth are at risk for being under-identified as in need of services for traumatic stress when compared to White or Hispanic youth. A final possible explanation for this finding is that recent juvenile justice involvement increases the need for trauma-specific service engagement.

There are both strengths and limitations to this study. A large and diverse sample of trauma-exposed adolescents was used for the study, and detailed information about trauma history and service utilization was available in the dataset. The measures used in the study have good validity and reliability established in previous studies and performed well in the current

study. Limitations to the study include using some self-report measures, using a *DSM-IV* measure of PTSD, and the age range of 12 to 16 that does not capture older adolescence. The use of the TSCC-A in the present study which can be extended to 17 year olds only resulted in 39 adolescents meeting inclusion criteria for the study. Service utilization data were only available for the past 30 days prior to seeking services at an NCTSN site, and it is possible that there could have been different service utilization patterns if the timeframe had been extended. Usage of health services for physical conditions was not captured, but emerging research on the adverse impact of trauma and PTSD on physical health suggests this is an area to measure in future studies of service usage by trauma-affected youth. Because the sample used in this study was a treatment-seeking, clinical sample of trauma-exposed adolescents in the US, the generalizability of the results is limited to that population.

This study demonstrated relationships between trauma history, trauma-related psychopathology (PTSD and dissociation), and patterns of service utilization. Future studies in this area should investigate how service utilization patterns are related to clinical and psychosocial outcomes, as well as how service utilization changes over time. It would also be useful to investigate other dimensions of service utilization and how they relate to outcomes. Prior studies of mental health service delivery have found that merely accessing services is not always enough to affect outcomes (Becker et al., 2015; Dawson & Berry, 2001). The following constructs of treatment engagement in mental health or social services have been found to be related to improved outcomes:

- Accessibility: Services are provided at convenient locations for the child and family; consideration is given to issues such as transportation or childcare that might inhibit access;

- Collaboration: There is active participation from the child and family in treatment planning, agreement with the treatment plan, and mutual goal setting;
- Cooperation: The child and family keep appointments, complete tasks, and cooperate with service providers;
- Cognitive engagement: Psychoeducation about services is provided, assessments are comprehensive, behaviors are modeled, and appropriate expectations are established; and
- Relationships with service providers: There is a sense of trust, empathy, alliance, and rapport from service providers with the child and family (Becker et al., 2015; Dawson & Berry, 2001).

Measuring these constructs along with specifying utilization of services might illuminate service delivery mechanisms and areas for system-level interventions to improve treatment for trauma survivors and provide treatment in ways that will maximize the likelihood of improved outcomes. Along with these dimensions of service utilization and treatment engagement, assessing the extent to which services and service organizations are trauma-informed might be another important service delivery domain for this population (Substance Abuse and Mental Health Services Administration [SAMHSA], n.d.).

A trauma-informed care paradigm involves organizational and professional commitment to understanding how trauma affects peoples' lives and taking active steps to avoid retraumatization in service delivery, where there are often disempowering or triggering modalities of care (SAMHSA, n.d.). Trauma-informed is warranted as a general practice for all of the service sectors examined in this analysis where trauma-exposed adolescents may be receiving services. Although it may be appropriate for some organizations and some communities to invest significant time and resources in trauma-informed service delivery,

organizational processes, and staff training, all service professionals can incorporate some relatively simple techniques into their practice, starting with an attitudinal shift. Rather than viewing youth through a lens of risk, problems, and poor life choices, a trauma-informed lens asks what kinds of adversity the individual may have experienced that led to the adoption of maladaptive coping mechanisms—and then seeks to work together to find new ways of coping (SAMHSA, n.d.).

Conclusion

Service utilization related to traumatic stress is an understudied topic among adolescents, and expanding the evidence base in this area is important given the high costs and burden of chronic illness for individuals with adverse childhood experiences like abuse and neglect. By identifying patterns of utilization, this study clarifies how trauma and trauma-related distress affect adolescent functioning and help-seeking. Understanding relationships between trauma and service utilization among adolescents may illuminate opportunities for intervention and system improvements that maladaptive patterns of help seeking from developing or continuing into adulthood. For adolescents exposed to maltreatment trauma, the trauma itself, rather than its subsequent psychopathology, is the most important factor in determining service usage intensity and complexity. Given the patterns complexity and frequency of multi-system service usage among this population, this study also suggests that comprehensive trauma treatment will necessarily involve inter-professional collaboration, intentional trauma-informed in all service sectors explored in this study, and better care coordination for traumatic stress related to child maltreatment trauma.

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Table 16: Service Usage Variables

Mental Health (High intensity)	Inpatient psychiatric unit, Residential treatment center, Day treatment program, In-home counseling, Group Home
Mental Health (Low intensity)	Outpatient therapy, Outpatient psychiatrist, treatment Case management, care coordination
Juvenile Justice (High intensity)	Detention center, training school, jail, prison
Juvenile Justice (Low intensity)	Probation officer, court counselor
Social services (High intensity)	Treatment foster care
Social services (Low intensity)	Foster Care, Child welfare, Department of Social Services
School (High intensity)	Special class or special school
School (Low intensity)	School counselor, psychologist, social worker
Healthcare (High intensity)	Hospital emergency room
Healthcare (Low intensity)	Primary care provider for symptoms related to trauma, emotional, behavioral problem

Table 17: Model Selection

Model	BIC	SSA BIC	AIC	VLMR LRT	p	AdLM R LRT	p	Entropy ^a
2 Class	25894.9	25828.2	25768.2	-13639.8	<.001	1536.0	<.001	0.66
3 Class	25760.4	25658.7	25567.4	-12863.1	.0693	220.3	.071	0.71
4 Class	25723.5	25586.9	25464.1	-12751.7	.0232	123.8	.024	0.69
5 Class	25665.4	25493.8	25339.6	-12689.1	<.001	144.9	<.001	0.60
6 Class	25691.1	25484.6	25298.9	-12615.8	.0419	62.0	.044	0.62

^aNote: Entropy is not statistical fit index, but an indicator of the quality of class differentiation.

Figure 3: Service Usage Typologies Latent Class Analysis

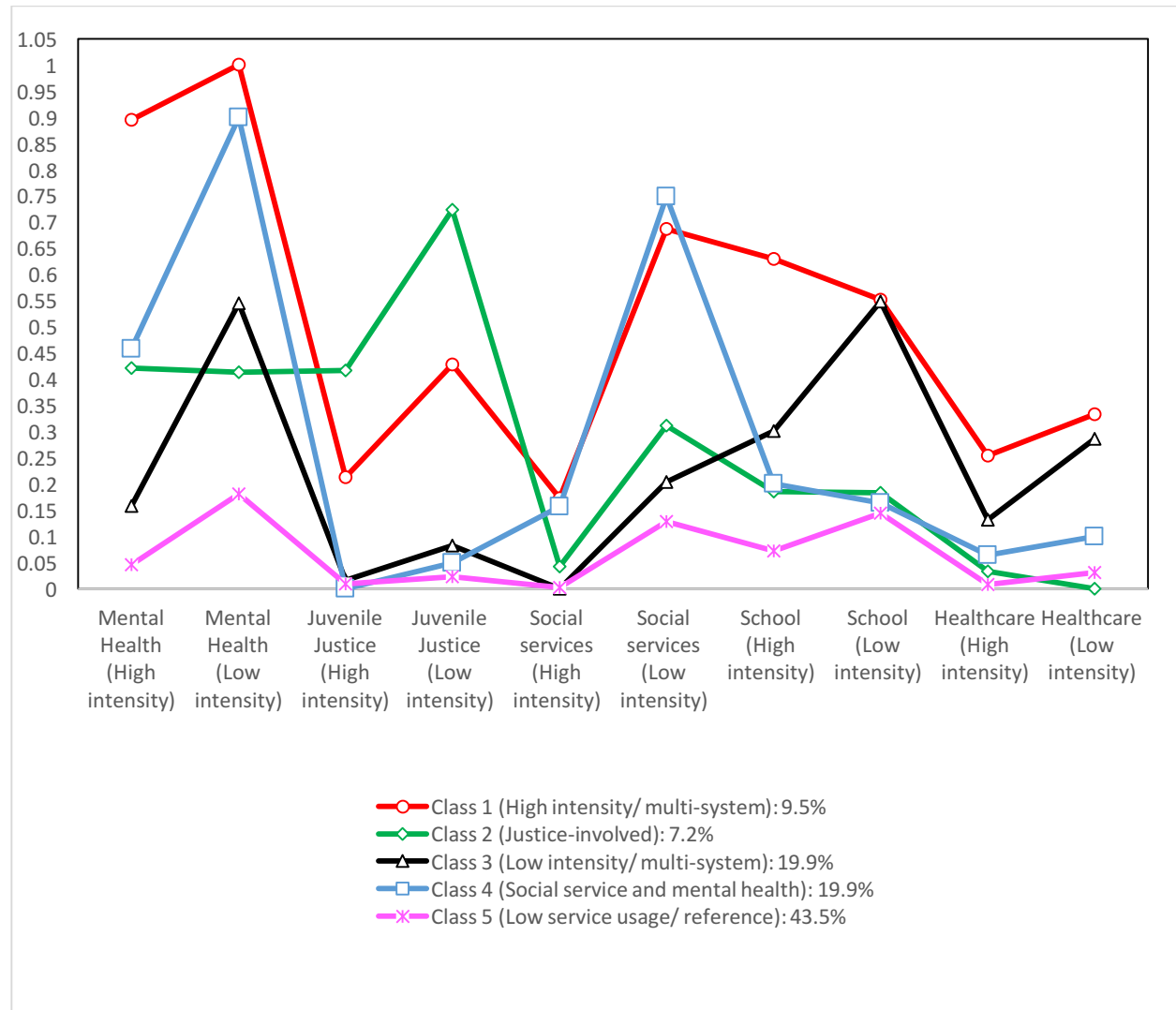


Table 18: Service Usage Group Comparison on Demographic Characteristics

N (%)	Overall 3081 (100.0)	High Intensity/ multi system 292 (9.5)	Justice- involved 223 (7.2)	Low intensity/ multi system 612 (19.9)	Social service and mental health 613 (19.9)	Low service usage/ reference 1341 (43.5)	χ^2 /F
Demographics							
Age M(SD)	14.5 (1.45)	14.93 (1.38)	15.34 (1.17)	14.46 (1.41)	14.52 (1.48)	14.32 (1.45)	28.71 ^{***}
Service count M(SD)	2.48 (2.37)	7.33 (2.05)	3.45 (1.59)	3.08 (1.31)	3.92 (1.53)	0.66 (0.72)	1663 ^{***}
Female	1863 (60.5)	168 (57.5)	101 (45.3)	301 (49.2)	441 (71.9)	852 (63.5)	20.76 ^{***}
Male	1218 (39.5)	124 (42.5)	122 (54.7)	311 (50.8)	172 (28.1)	489 (36.5)	56.72 ^{***}
White	998 (32.4)	102 (34.9)	78 (35.0)	174 (28.4)	276 (45.0)	368 (27.4)	70.56 ^{***}
Black	705 (22.9)	76 (26.0)	35 (15.7)	123 (20.1)	162 (26.4)	309 (23.0)	11.28 ^{***}
Hispanic	1136 (36.9)	63 (21.6)	67 (30.0)	174 (28.4)	155 (25.3)	677 (50.5)	134.28 ^{***}
Other	184 (6.0)	18 (6.2)	11 (4.9)	35 (5.7)	53 (8.6)	67 (5.0)	10.73 ⁺
Residence							
Parents	1925 (62.5)	92 (31.5)	108 (48.3)	411 (67.2)	245 (40.0)	1069 (79.7)	514.84 ^{***}
Relatives	364	15	21	60	104	164	19.35 ^{***}

	(11.8)	(5.1)	(9.4)	(9.8)	(17.0)	(12.2)	
Foster care	275 (8.9)	43 (14.7)	9 (4.0)	11 (1.8)	175 (28.5)	37 (2.8)	360.91 ^{***}
Residential treatment	218 (7.1)	87 (29.8)	40 (17.9)	7 (1.1)	68 (11.1)	16 (1.2)	420.44 ^{***}
Other	122 (4.0)	20 (6.8)	9 (4.0)	14 (2.3)	45 (7.3)	34 (5.5)	32.52 ^{***}
Insurance Status							
None	811 (26.3)	58 (19.9)	43 (19.3)	146 (23.9)	128 (20.9)	436 (32.5)	31.59 ^{***}
Private	351 (11.4)	17 (5.8)	18 (8.1)	77 (12.6)	54 (8.8)	185 (13.8)	22.77 ^{***}
Public	1885 (61.2)	186 (63.7)	131 (58.7)	286 (46.7)	468 (76.3)	814 (60.7)	63.98 ^{***}
Both	34 (1.1)	3 (1.0)	0 (0.0)	8 (1.3)	8 (1.3)	15 (1.1)	3.22 ⁺

*Value is significant at the 0.05 level.

**Value is significant at the 0.01 level.

Table 19: Service Usage Group Comparison on Trauma and Psychopathology

	Overall 3081 (100.0)	High Intensity/ multi system 292 (9.5)	Justice- involved 223 (7.2)	Low intensity/ multi system 612 (19.9)	Social service and mental health 613 (19.9)	Low service usage/ reference 1341 (43.5)	[±] X2/ ⁺⁺ F
Trauma							
Trauma before age 6	906 (29.4)	122 (41.8)	54 (24.2)	135 (22.1)	264 (43.1)	330 (24.6)	107.07 ⁺⁺⁺
Sexual abuse	797 (25.9)	107 (36.6)	37 (16.6)	112 (18.3)	240 (39.2)	301 (22.4)	108.72 ⁺⁺⁺
Physical Abuse	1037 (33.7)	138 (47.3)	66 (29.6)	152 (24.8)	332 (54.2)	349 (26.0)	195.67 ⁺⁺⁺
Emotional abuse	1337 (43.4)	174 (59.6)	78 (35.0)	196 (32.0)	378 (61.7)	511 (38.1)	153.98 ⁺⁺⁺
Neglect	816 (26.5)	130 (44.5)	44 (19.7)	102 (16.7)	315 (51.4)	225 (16.8)	333.19 ⁺⁺⁺
Trauma count M(SD)	3.85 (2.42)	5.09 (2.85)	4.15 (2.66)	3.67 (2.19)	4.44 (2.48)	3.39 (2.2)	43.90 ⁺⁺⁺
Maltreatment count M(SD)	1.14 (1.28)	1.86 (1.48)	1.06 (1.25)	0.98 (1.18)	1.66 (1.4)	0.85 (1.08)	75.99 ⁺⁺⁺
Psychopathology Symptoms							
PTSD Symptoms M(SD)	8.41 (5.39)	9.5 (5.31)	8.3 (5.28)	8.69 (5.39)	8.55 (5.48)	8.08 (5.36)	4.19 ⁺⁺⁺
Dissociation symptoms M(SD)	2.28 (2.38)	2.39 (2.59)	1.98 (2.14)	2.49 (2.45)	2.21 (2.34)	2.25 (2.37)	2.07 ⁺⁺
Externalizing behavior M(SD)	62.4 (11.94)	66.18 (11.23)	65.33 (10.49)	64.38 (11.24)	62.31 (12.39)	60.58 (11.83)	19.71 ⁺⁺⁺

Internalizing behavior M(SD)	62.4 (12.21)	63.91 (10.27)	61.99 (11.67)	64.18 (11.8)	61.62 (12.72)	61.84 (12.47)	4.772 ^{++**}
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*Value is significant at the 0.05 level.

**Value is significant at the 0.01 level.

Table 20: Multinomial Logistics Regression Model

Outcome	High intensity/multi-system (1)		Justice-involved (2)		Low intensity/multi system (3)		Social service and mental health (4)	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
PTSD	0.99	0.62, 1.55	0.67	0.38, 1.18	0.79	0.55, 1.13	1.05	0.75, 1.46
Dissociation	0.91	0.55, 1.51	0.91	0.53, 1.58	1.14	0.83, 1.56	0.63*	0.43, 0.92
Both	0.92	0.42, 2.04	0.004**	0.004, 0.004	1.13	0.69, 1.84	1.04	0.61, 1.77

Notes. Outcome variable: Service usage latent class. Covariates: Age, gender, race, insurance type, primary residence, number of trauma exposures, type of trauma exposure, age of trauma exposure.

*Significant at 0.05 level

**Significant at 0.01 level

CHAPTER 4: The dissociative subtype of PTSD among adolescents: Co-occurring PTSD, depersonalization/derealization, and other dissociation symptoms

Abstract

Objective: The purpose of this study was to examine the co-occurrence of PTSD and dissociation in a clinical sample of trauma-exposed adolescents, first evaluating evidence for the depersonalization/derealization dissociative subtype of PTSD as defined by the *DSM-5*, and then examining a broader set of dissociation symptoms.

Methods: A sample of trauma-exposed adolescents ages 12 to 16 (n=3081) from the National Child Traumatic Stress Network Core Data Set was used to meet the study objectives. Two models of PTSD/dissociation co-occurrence were estimated using latent class analysis, one with two dissociation symptoms and the other with ten dissociation symptoms. After model selection, groups within each model were compared on demographics, trauma characteristics, and psychopathology.

Results: Model A, the depersonalization/derealization model, had five classes: (1) dissociative subtype/high PTSD; (2) high PTSD; (3) anxious arousal; (4) dysphoric arousal; and (5) a low symptom/reference class. Model B, the expanded dissociation model, also had five classes: (1) high dissociation; (2) high PTSD; (3) dissociative amnesia; (4) low PTSD; and (5) a low symptom/reference class.

Conclusion: These two models provide new information about the specific ways PTSD and dissociation co-occur and illuminate some differences between adult and adolescent trauma symptom expression. A dissociative subtype of PTSD can be distinguished from PTSD alone among adolescents, but assessing a wider range of dissociative symptoms is needed in order to fully characterize adolescent traumatic stress responses.

Introduction

Maltreatment in early childhood is a direct trauma to development and can create the foundation for a life course trajectory of social, emotional, and cognitive impairment, health risk behaviors, disease, disability, and, ultimately, early death (Felitti et al., 1998). This type of trauma, when it is repetitive, prolonged, interpersonal, and occurring during developmentally sensitive times, is understood as *complex trauma*, and it often leads to a complex form of posttraumatic stress disorder (PTSD), a disordered response to shocking, frightening, or dangerous events (Herman, 1992; van der Kolk et al., 2009). Complex PTSD is the result of impaired self-regulation resulting from complex trauma and includes emotional dysregulation, alterations in consciousness including dissociative symptoms, distorted perceptions of self and of the perpetrator, alterations in interpersonal relationships, and loss of systems of meaning (Herman, 1992).

For individuals who experience complex trauma at a young age, self-regulation and self-perception become disordered. The child's attachment security is disrupted and forces a neurobiological shift in the brain from focusing on learning, growing, and developing to focusing on survival, threats, and danger (Courtois & Ford, 2009; Teicher et al., 2002). The survival brain is governed by fight-or-flight mechanism, and the brain is forced to exchange learning, growth, and self-development for survival and safety (Courtois & Ford, 2009; Teicher et al., 2002).

Under-developing or losing self-regulatory processes as a result of trauma leads to self-dysregulation in a variety of biopsychosocial domains, affecting physical health, mental health, interpersonal relations, and behavior (van der Kolk et al., 2009).

Although the evidence base for complex PTSD and clinical utility of this conceptualization of trauma has continued to grow, it was not included as a formal diagnosis in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)* (American Psychiatric Association [APA], 2013; Friedman et al., 2013). However, a dissociative subtype of PTSD was established, defined by symptoms of depersonalization and derealization in addition to symptoms of PTSD (APA, 2013). The subtype was noted to possibly capture the subset of individuals with more severe trauma histories, complex posttraumatic stress sequelae, and unique treatment needs (Friedman, 2013). Although controversy in the field remains about complex PTSD and whether or not it should be a formal diagnosis, this change in the *DSM-5* reflects the growing evidence base demonstrating that trauma, dissociation, and posttraumatic stress frequently co-occur in survivors of maltreatment.

Dissociation often develops as an adaptive, protective coping mechanism to attenuate distress related to overwhelming childhood trauma (Mutluer et al., 2017). Maltreatment involving direct harm, such as sexual or physical abuse, as well as less overt types of maltreatment such as emotional abuse, neglect, and frightening or unpredictable parenting, can all lead to the development of dissociative coping in children (Briere et al., 2017; Dorahy et al., 2016; Schimmenti & Caretti, 2016). With this understanding of the trauma-related etiology of dissociation, dissociation can be understood as a division or disintegration of an individual's personality that may manifest as: (1) negative symptoms (e.g., some types of amnesia, paralysis), (2) positive symptoms (e.g., flashbacks, voices, intrusions), (3) psychoform symptoms (e.g.,

hearing voices, some types of amnesia), and (4) somatoform symptoms (e.g., anesthesia, tics, somatization) (Nijenhuis & Van der Hart, 2011). Although dissociation can be protective during a traumatic experience in childhood when there are no other options for escape, it becomes maladaptive when it persists into adulthood and is deployed in the face of ordinary, everyday stressors that do not pose a significant threat. Adults with maladaptive dissociative tendencies may not be able to distinguish situations that are genuinely threatening or dangerous and often have trouble tolerating and self-regulating intense emotions, particularly those that come with trauma-related flashbacks, intrusion, and arousal (International Society for the Study of Trauma and Dissociation [ISSTD], n.d.).

There have been several adult studies of the dissociative subtype of PTSD that provide evidence for the subtype and characterize the ways trauma, PTSD, and dissociation are expressed in trauma survivors. Depersonalization and derealization emerged in these studies as the two dissociation symptoms that characterized a unique, high-severity subset of PTSD cases, and individuals with the dissociative subtype more frequently endorsed childhood trauma and adult sexual trauma (Wolf et al., 2012a; Wolf et al., 2012b). Additionally, women in the dissociative group had higher levels of avoidant and borderline personality disorder behaviors (Wolf et al., 2012a; Wolf et al., 2012b). Prevalence estimates of the dissociative subtype range from 12% to 50% of PTSD cases (Armour, Karstoft, & Richardson, 2014; Choi et al., under review; Stein et al., 2013; Wolf et al., 2012a; Wolf et al., 2012b).

As evidence for the relationships between complex trauma, dissociation, and PTSD has accumulated among veteran and adult populations, a gap in the literature remains for how these phenomena affect children and adolescents, as well as how patterns of co-occurring PTSD and dissociation change during development and across the lifespan. Although there is a need to

study these phenomena across childhood, adolescence is a particularly important development epoch to capture because it will begin to build an evidence that bridges what is known about adults to children and clarifies the life course of traumatic stress symptomatology. Adolescent PTSD tends to look similar to adult PTSD, but adolescents are more likely to display aggression, poor impulse control, and traumatic reenactment (Hamblen & Barnett, 2016). There are some important differences in the expression of dissociative symptomatology when comparing adolescents and adults as well. Dissociation symptoms in adolescents are often subtler and may be mistaken for inattentiveness, as adolescents tend to display less dramatic changes in voice, mood, and mannerisms, and briefer trance states (Dalenberg et al., 2012; International Society for the Study of Trauma and Dissociation [ISSTD], n.d.). Adolescents also often lack of insight that dissociated parts or voices the adolescent is experiencing are not normal (ISSTD, n.d.). These differences are consistent with adolescent development, when independence from parents, role and identity development, peer relationships, complex reasoning, and physical and sexual maturation occur (Centers for Disease Control and Prevention [CDC], n.d.). Studies of the new PTSD criteria with samples of adolescents have provided evidence of complex posttraumatic stress sequelae in response to severe trauma, but the dissociative subtype has received little attention as it relates to child development (Perkonig et al., 2016; Modrowski et al., 2017). In light of the known differences in the effects of and responses to childhood trauma exposure versus adult trauma exposure, as well as the life course changes in expression of dissociation, exploring the co-occurrence of PTSD and dissociation among adolescents is necessary to evaluate the clinical utility of the dissociative subtype of PTSD for youth. The purpose of this study was to examine the co-occurrence of PTSD and dissociation for a clinical sample of trauma-exposed adolescents, first evaluating evidence for the depersonalization/derealization

dissociative subtype of PTSD as defined by the *DSM-5*, and then examining a broader set of dissociation symptoms.

Methods

Design and Sample

A secondary analysis of the National Child Traumatic Stress Network (NCTSN) Core Data Set (CDS) was used to answer the research questions for this study (National Child Traumatic Stress Network [NCTSN], 2009; Steinberg et al., 2014). This dataset contains clinical data from over 14,000 trauma-exposed children ages 0 to 21 from 56 NCTSN sites in the US, collected from 2010 to 2014. Additional information about the CDS is reported elsewhere (Briggs et al., 2012; Greeson et al., 2014). The NCTSN established this database as a quality improvement project to examine trauma, behavioral health, treatment, and clinical outcomes for clients at NCTSN sites. A subset of the full CDS was selected for this study. Cases were included in the subset if they were adolescents ages 12 to 16, had baseline data available, experienced at least one trauma exposure, and were not missing assessments of PTSD and dissociation. The age range was chosen to capture the specific developmental epoch of adolescence and make comparisons to adults. The final sample used in the analysis was 3,081 adolescents. The University of Michigan Institutional Review Board reviewed and approved this study.

Measures

Demographics. Demographic data available in the CDS were age in years, gender, race/ethnicity (White, Black, Hispanic, Other), residence (with parents, with other relatives, foster care, residential treatment, other), and insurance status (private, public, both, neither). In

prior studies with the CDS, insurance status has been used as a proxy variable for socioeconomic risk (Briggs et al., 2012; Greeson et al., 2011; Greeson et al., 2014; Kiser et al., 2014).

Trauma. The CDS General Trauma Information Form assessed 20 different trauma exposures and the age when the trauma occurred. Trauma variables used for this analysis were a total trauma count, a maltreatment trauma count, individual variables for each of four maltreatment types (physical abuse, sexual abuse, emotional abuse, neglect), and whether the trauma occurred before or after age 6. Six years was chosen as a cutoff age to denote early childhood maltreatment trauma which can lead to more complex posttraumatic stress (Courtois & Ford, 2009; Herman, 1992).

PTSD. The University of California Los Angeles PTSD Reaction Index for *DSM-IV* (UCLA PTSD-RI) is a 48-item pediatric measure of trauma exposure and PTSD, administered in an interview or in self-report form (Elhai et al., 2013; Steinberg et al., 2004; Steinberg et al., 2013). The 20 PTSD symptom items and 2 associated features of PTSD items (trauma-related guilt, fear of trauma recurrence) were used for this study. This measure contains additional items for some symptoms (C6, emotional numbing; C7, foreshortened future; D2 anger/irritability), two questions for criterion A, and items assessing the presence of two PTSD associated features, trauma-related guilt and fear of trauma recurrence (Steinberg et al., 2004). The UCLA PTSD-RI was used to determine PTSD diagnosis and number of PTSD symptoms using scores of 2 or greater to consider a symptom endorsed and the *DSM-IV* to make a PTSD diagnosis (at least one B cluster item, at least three C cluster items, and at least two D cluster items; this diagnosis did not consider level of functional impairment) (APA, 2000).. The items on the UCLA-PTSD-RI map directly onto the *DSM-IV* PTSD symptom clusters, and a PTSD diagnosis status variable

was generated based on the *DSM-IV* criteria for the disorder (APA, 2000). The internal consistency reliability for the current sample on the UCLA PTSD-RI was 0.93.

Dissociation. The Trauma Symptom Checklist for Children-Alternate Version (TSCC-A) is a 44-item measure of traumatic stress symptoms designed for children ages 8 to 16 years (Briere, 1996). Dissociation was measured with the dissociation subscale of the TSCC-A and defined according to the *DSM-5* PTSD dissociative subtype symptoms, depersonalization and derealization (APA, 2013). These two dissociation symptoms were considered present for scores of 2 or higher on a 0 (never) to 3 (almost all of the time) scale. The internal consistency reliability for only these two items was 0.69. Overall, the TSCC-A dissociation subscale measures overt dissociation and fantasy with ten items, and a count variable with all ten dissociation symptoms was created for the analysis. The overall internal consistency reliability for the TSCC-A was 0.97.

Behavioral Symptoms. The Child Behavior Checklist for Ages 6 to 18 (CBCL) internalizing and externalizing behavior broadband scales were used to measure emotional and behavioral problems (Achenbach, 1991; Achenbach & Rescorla, 2001). The behavioral items are reported on 3-point Likert scales (0/Not true, 2/Very true or often true), and for this analysis, and standardized t-scores for internalizing and externalizing behavior were used. These standardized scores are based age- and gender-normed standardized scores, where 50 is the mean score with a standard deviation of 10 for each age (6–10 years, 11–18 years) and gender (girls, boys) group (Achenbach, 1991). Scores below 60 are considered normal, scores of 60 to 63 are considered borderline, and scores higher than 63 are considered a clinically significant for behavioral problems (Achenbach & Rescorla, 2001). The internalizing behavior subscale internal

consistency reliability was 0.90. The externalizing behavior subscale internal consistency reliability was 0.92.

Analysis

All analyses were conducted using Mplus and R, version 3.2.3, and p-values were set at 0.05. Data were missing in low proportions (<10% per variable) with no distinguishable patterns of missingness and were coded as ‘no’ responses (i.e., if the clinician did not record the symptom or trauma exposure, that item was assumed to be absent) (Low, Seng, & Miller, 2008).

Frequencies and descriptive statistics were examined for all variables used in the analysis. Latent class analysis (LCA) was used to examine the dissociative subtype of PTSD in two separate models distinguished by the way dissociation was operationalized. Latent class analysis is a statistical technique used to identify unobserved (latent) heterogeneity in a population from categorical data (McCutcheon, 1987). This technique was selected to replicate a prior study that used latent profile analysis (LPA)—which uses continuous rather than categorical data—to look for evidence of an unobserved dissociative subtype of PTSD among adults (Wolf et al., 2012b).

In the first model (Model A), 22 PTSD items from the UCLA PTSD-RI representing the B, C, and D symptom clusters plus PTSD associated features (trauma-related guilt, fear of trauma recurrence) and 2 dissociative subtype items (depersonalization and derealization) from the TSCC-A were used to derive latent classes (24 items total) (APA, 2000; APA, 2013). In the second model (Model B), the dissociation component was expanded. The same 22 PTSD items and 10 dissociation items (depersonalization and derealization plus all other items from the dissociation scale of the TSCC-A) were used to derive latent classes (32 items total) in the second model. For each model, first, a 2-class model was estimated. Then, the number of latent classes was incrementally increased, comparing the fit of each new model to the previous model.

Several statistical fit indices were used to compare models and select the most parsimonious model that fit the data best, including Bayesian information criterion (BIC), sample-size adjusted Bayesian information criterion (SSABIC) Akaike information criterion (AIC), and the Vuong-Lo-Mendel-Rubin (VLMR) likelihood ratio test (Nylund, Asparouhov, & Muthén, 2007). Lower BIC or AIC values indicate that the model fit is improved by adding a class. The VMLR likelihood ratio test compares a model with k classes to a model with $k + 1$ classes. It generates a test statistic and p-value, and if the p-value is less than .05, the model fit is improved by adding a class. To determine the quality of the latent classes, entropy values and substantively meaningful characteristics of the classes were assessed by the investigators. Entropy values range from 0 to 1, and values closer to 1 indicate better differentiation and separation between classes (Asparouhov & Muthén, 2014). After selecting the best-fit latent class model and assigning cases in the sample to their most likely latent classes, chi-square tests and ANOVA tests with pairwise follow up tests were used to examine differences between latent classes for each of the two models.

After deriving the two sets of latent classes, the sample was divided into four groups according to their trauma-related symptomatology to assess agreement between *DSM-5* diagnosis of the dissociative subtype and latent classes: (1) PTSD-only, (2) dissociation-only, (3) both PTSD and dissociation, which represents the dissociative subtype of PTSD (PTSD-D), and (4) neither. A 3-step approach of modal maximum likelihood was used to examine agreement between this *DSM-5* grouping variable and the latent classes (Asparouhov & Muthén, 2014; Vermunt, 2010). This approach adjusts for misclassification bias in assigning latent class membership using multinomial logistic regression and uncertainly probabilities.

Results

Sample

The mean age of the sample was 14.5 years ($SD = 1.45$). The sample was 60.5% female and 39.5% male. The racial proportions of the sample were 32.4% white, 22.9% black, 36.9% Hispanic, and 6.0% other. Public insurance status was considered a proxy variable for socioeconomic risk, and 61.2% of the sample had public insurance. Sixty-three percent of the sample resided with their parents, while 11.8% were living with other relatives, 8.9% were in foster care, 7.1% were in residential treatment, and 4.0% had another living situation. The sample had a mean of 3.9 overall trauma exposures ($SD = 2.42$, minimum = 1, maximum = 14) and a mean of 1.1 maltreatment trauma exposures ($SD = 1.28$, minimum = 0, maximum = 4).

Model Selection

Model A: *DSM-5* dissociation model. After evaluating several fit indices and model quality both statistically and substantively, a 5-class model was selected as the best fit for the data (Table 1). This model was favored by the VLMR likelihood ratio test. The information criterion values favored 6 or 7 class models. However, ultimately, the 5-class model was selected because it was both statistically supported and substantively interpretable; the 5-class model reflects the 5-factor structure of PTSD found previously with the NCTSN sample (Elhai et al., 2013). This model classified 14.4% of the sample in group 1, 27.1% in group 2, 20.9% in group 3, 16.2% in group 4, and 21.4% in group 5.

[Insert Table 1]

Model B: Expanded dissociation model. A 5-class model was selected for Model B to make comparisons with the Model A (Table 2). Although statistical fit indices would have

avored a 6 or 7 class model, substantive comparison and interpretation of the 5 class model versus the 6 and 7 class models indicated that the 5 class model represented the data well, allowed for comparisons with model 1, and had theoretical validity, agreeing with previous studies with this sample (Elhai et al., 2013). The 6-class model presented a complex mixture of arousal and dissociation symptom profiles that lacked clear interpretability. In light of the purpose of the study, we prioritized substantive evaluation of the models over the statistical indicators. This model classified 14.7% of the sample in group 1, 21.4% in group 2, 13.0% in group 3, 31.1% in group 4, and 19.8% in group 5.

[Insert Table 2]

Description of Latent Classes

Model A: *DSM-5* dissociation model. The profile of each latent class in the *DSM-5* dissociation model is shown in Figure 1. Class 1A (Dissociative subtype/high PTSD) was characterized by higher probability of PTSD symptoms in all clusters and the highest probability of depersonalization and derealization symptoms of all the groups. Class 2A (High PTSD) was similar to class 1A, but with an overall lower probability of each PTSD and dissociation symptom. The differences between class 1A and class 2A were that class 1A had higher probabilities of having the following in relation to other symptoms within their group: (1) somatic symptoms (B5), (2) avoidance of people, places, or things that were reminders of the trauma (C2), (3) sense of foreshortened future (C7a), (4) trauma-related guilt (AFa), and (5) depersonalization and derealization. Class 3A (Anxious arousal) had a symptom profile that reflected the anxious arousal symptom cluster (higher probability of D4 and D5) of PTSD that has been found previously with this sample (Elhai et al., 2013). Class 4A (Dysphoric arousal) reflected the dysphoric arousal factor (higher probability of D1, D2, and D3 symptoms which

represent hyperarousal). Class 5A (Low symptom/reference) had the lowest probabilities of all symptoms.

[Insert Figure 1]

Model B: Expanded dissociation model. Figure 2 shows the latent class profiles for the expanded dissociation model and which items were most prominent for each class by symptom cluster. Class 1B (Dissociative subtype/high PTSD) had the highest probabilities of all PTSD and all dissociation symptoms of the 5 groups, as well as characteristics of dysphoric arousal. This group was relatively distinct from all other classes in that it had the highest likelihood of derealization, depersonalization, and daydreaming, which may be a behavioral manifestation of derealization and depersonalization. Class 2B (High PTSD) had an elevated PTSD symptom profile, but with a markedly lower dissociation profile compared with class 1B. Class 1B also differed from class 2B in that it had higher probability of somatic symptoms, a higher avoidance symptom profile, and displayed anxious (items D4 and D5) rather than dysphoric arousal (items D1, D2a/b, D3). Class 3B (Dissociative amnesia/detached arousal) was lower than either class 1B or class 2B on its PTSD profile, but had a much higher dissociation profile than class 2B. Class 3B had a high probability of dissociative amnesia and dissociative avoidance relative to other within-group dissociation symptoms. It also had dysphoric arousal characteristics and a lower probability of flashbacks (B1), nightmares (B2), PTSD avoidance symptoms (C cluster), trauma-related guilt (AFa), and fear or trauma recurrence (AFb). Class 4B (Anxious arousal) had a low avoidance symptom profile, anxious arousal, and high dissociative amnesia and dissociative avoidance symptoms relative to other dissociation symptoms within that group, although the dissociation symptom profile was low overall. This group also had minimal emotional numbing and dysphoria symptoms. Class 4B was similar to class 3B on all PTSD

symptoms except that it had a lower probability of endorsing detachment items C4 (stay alone), C5 (feel alone), and C6a (emotional numbing happiness/love) as well as most of the dissociation items. Class 5B (Low symptom/reference) had the lowest symptom profile of any group.

[Insert Figure 2]

Modal Maximum Likelihood Estimation

Model A: *DSM-5* dissociation model. To compare agreement between latent classes identified in this model and the *DSM-5* diagnosis of the PTSD dissociative subtype, the R3Step function of Mplus was used, which adjusts for misclassification bias in assigning latent class membership to cases in the sample. Class 1A (Dissociative subtype/High PTSD) contained 83.4% of PTSD-D cases. Class 2A (High PTSD) contained 62.9% of PTSD-only cases and 61.1% of dissociation-only cases.

[Insert Table 3]

Model B: Expanded dissociation model. In model 2, 89.2% of PTSD-D cases were in class 1B (High dissociation and PTSD), 74.0% of PTSD-only cases were in class 2B (High PTSD), and 66.9% of dissociation-only cases were in class 3B (Dissociative amnesia/detached arousal). This model better differentiated the *DSM-5* diagnostic groups than model 1.

[Insert Table 4]

Model A and Model B Comparison

Both models demonstrated consistent low probability of PTSD symptoms B3 (feeling of being back at the time of the trauma and reliving it), C3 (trouble remembering important parts of the trauma), and C6b (trouble feeling sadness or anger), as well as depersonalization, for all classes. For the additional items on the UCLA PTSD-RI, scores did not seem to differ within each pair of C and D symptoms in either model, with the exception of item C6a, which better

differentiated the high-severity classes in both models than C6b. The cluster A items were very similar to the cluster B items in both models and did not seem to have an effect on class differences. There was a consistent high probability of PTSD symptoms B4 (becoming upset or afraid when reminded of the trauma), C1 (avoiding feeling, talking, or thinking about the trauma), and D2a (feeling grouchy or angry) across all classes in both models. In model B when additional dissociation symptoms were accounted for, the anxious and dysphoric arousal groups were not clearly differentiated as in model A. However, the two high dissociation groups (class 1B and class 3B) reflected dysphoric arousal symptoms, while the two low dissociation groups (class 2B and class 4B) demonstrated more anxious arousal symptoms. Model A classified 83.4% of PTSD-D cases in class 1A, but classified both PTSD-only (62.9%) and dissociation-only (61.1%) cases into the same class (class 2A). These groups were better differentiated in model B. Class 1B (Dissociative subtype/high pTSD) contained 89.2% of PTSD-D cases, class 2B (high PTSD) contained 74.0% of PTSD-only cases, and class 3B (dissociative amnesia/detached arousal) contained 66.9% of dissociation-only cases.

Comparison of Latent Classes

Model A: Comparison of Latent Classes in the *DSM-5* Dissociation Model.

Demographics. The dissociative subtype/high PTSD group (Class 1A) was slightly older than the other groups. Class 1A also contained the largest proportion of females (75.7%). There were larger proportions of adolescents living in residential treatment in class 1A (10.6%) and class 2A (8.7%) than the other groups. There were no significant group differences by race or insurance status.

[Insert Table 5]

Trauma History and Psychopathology Symptoms. Class 1A (Dissociative subtype/high PTSD) had the largest proportions of adolescents with exposure to sexual abuse (31.9%) and physical abuse (40.7%). This class also had the largest proportion of adolescents with maltreatment before age 6 (33.3%). Class 1A (Dissociative subtype/high PTSD) had the largest number of overall trauma exposures (mean= 4.57, SD= 2.73) and maltreatment exposures (mean= 1.38, SD= 1.34). However, the differences in overall number of trauma exposures (difference= 0.37, $p = .06$) and number of maltreatment trauma exposures (difference= 0.07, $p = .89$) were not significantly different between class 1A and class 2A. Both class 1A and class 2A had a significantly higher overall number of trauma exposures relative to all other groups and number of maltreatment trauma exposures relative to all other groups.

Adolescents in class 1A (Dissociative subtype/high PTSD) had the highest mean number of PTSD symptoms (mean= 16.9) of all the groups, followed by class 2A (High PTSD) with a mean of 12.2 symptoms. The difference between these two groups for PTSD symptom count was statistically significant (difference= 4.7; $p < .001$), as were mean differences between class 1A and all other classes and class 2A and all other classes. The number of dissociation symptoms decreased progressively across the classes, except that classes 3A and 4A did not differ from one another. Class 1A had more dissociation symptoms than any other group. The differences between class 1A and class 2A were not statistically significant for externalizing behavior. For internalizing behavior, class 1A had more internalizing behavior symptoms than any other class.

[Insert Table 6]

Model B: Comparison of Latent Classes in the Expanded Dissociation Model

Demographics. Class 1B was slightly older than the other groups (mean age= 14.74, SD= 1.38), but the only significant group differences in age were in relation to the reference

group (class 5B), which was the youngest (mean age= 14.23, SD= 1.46). For gender, class 1B (76.4%) and class 2B (73.9%) had higher proportions of females compared to males. The reference group (class 5B) was the only class with more males than females (57.3%). There were no significant differences between the groups by race or insurance status. Classes 1B, 2B, and 4B had the highest proportions of adolescents living in residential treatment (11.5%, 9.7%, and 6.7%, respectively).

[Insert Table 7]

Trauma History and Psychopathology Symptoms. The two high PTSD groups, class 1B (Dissociative subtype/high PTSD) and class 2B (High PTSD), contained higher proportions of adolescents reporting maltreatment before age 6 than the other groups. These two classes also had the highest amounts of sexual abuse, physical abuse, and emotional abuse. There were no significant group differences for neglect. Class 1B had the highest number of total trauma exposures (mean= 4.3, SD= 3.0), but it did not differ significantly from class 2B (mean= 4.1, SD= 3.0) on this variable. Looking at the count of maltreatment only, class 2B had the highest mean number of maltreatment exposures (mean= 1.44, SD= 1.37), but this number was not significantly different than the class 1B average (mean= 1.31, SD= 1.32).

Class 1B had the highest mean number of PTSD symptoms (mean= 16.3, SD= 2.0), followed by the other four classes in order. The differences between all class pairings were all statistically significant. The same pattern held true for dissociation symptoms. Each class differed significantly on dissociation symptoms from each other class, except for the comparison of class 2B with class 3B, where class 3B had a mean of 2.7 more dissociation symptoms than class 2B ($p < .001$). Comparing behavioral symptoms, classes 1B had significantly more externalizing and internalizing behavior symptoms than class 2B or 4B.

Discussion

This study evaluated two latent class models of co-occurring PTSD and dissociation symptoms, one with the two *DSM-5* PTSD dissociative subtype items of depersonalization and derealization, and one with an expanded set of ten dissociation symptoms (APA, 2013). These two models provide new information about the specific ways PTSD and dissociation co-occur and illuminate some differences between adult and adolescent trauma symptom expression. Latent class models identified distinct sub-groups in a national sample of adolescents receiving trauma treatment services based on profiles of PTSD and dissociative symptoms. When only the dissociative symptoms in the dissociative sub-type of PTSD (depersonalization and derealization) were considered, a dissociative PTSD class and a PTSD without dissociative features class were identified, as well as two additional classes characterized by sub-sets of PTSD symptoms (anxious arousal and dysphoric arousal), and a relatively low symptom sub-group. When additional dissociative symptoms were included, similar sub-groups were identified, but the dysphoric arousal sub-group also was characterized by dissociative amnesia and detached arousal. These findings support the extension of the primarily adult-based PTSD-dissociative subtype to traumatized adolescents, while also suggesting that a wider range of dissociative symptoms than the PTSD-D depersonalization and derealization symptoms should be considered when assessing and treating traumatized adolescents who are dysphoric but do not report PTSD flashbacks, nightmares, avoidance, guilt or fear symptoms (Lanius et al., 2010).

Model A demonstrated some of the ways the dissociative subtype of PTSD characterized by depersonalization and derealization manifests differently for adolescent populations than for adult populations. Adult studies of the subtype found that the individuals in the dissociative group had more flashbacks, childhood sexual abuse, and adult sexual trauma than individuals in

the high PTSD alone group (Wolf et al., 2012b). In the current study, the two high PTSD classes, 1A and 2A, did not differ significantly on number of trauma exposures or number of maltreatment trauma exposures and had very similar rates of exposure to each maltreatment type. Class 1A (Dissociative subtype/high PTSD) had more somatic symptoms, avoidance of people, places, or things that were reminders of the trauma, sense of foreshortened future, and trauma-related guilt. This class also had more overall PTSD symptoms, dissociation symptoms, and internalizing behavior symptoms than any other class, and 83.4% of cases of the PTSD dissociative subtype in this sample were in class 1A. The PTSD symptom profile for adolescents with the PTSD dissociative subtype appears to differ from that of adults, and number and characteristics of trauma exposures was not a significant variable in class differences the way it was for adults.

In Model B, the expanded conceptualization of dissociation co-occurring with PTSD captured several more nuanced dissociative subgroups including a dissociative amnesia/detached arousal group (3B) and a high dissociation and PTSD group with depersonalization and derealization playing relatively minor roles in characterizing the group compared with other dissociation symptoms (1B). These two high dissociation classes did not differ on maltreatment trauma exposures, but class 1B had more overall trauma exposures than class 3B and an average of seven more PTSD symptoms. Both class 1B and class 2B, the two high PTSD groups—one with high dissociation and one without—had more trauma exposures and maltreatment exposures than class 3B. However, class 3B was unique in that it was characterized by higher relative probability of dissociative amnesia symptoms. This finding might lend support to the hypothesis that dissociation in some youth functions to obscure recall of traumatic experiences, in addition to attenuating distress. Previous studies have found severe dissociation in survivors of

severe childhood maltreatment in the absence of affect dysregulation or PTSD (Putnam, 2003). Additionally, there is evidence that amnesia for severe trauma experiences such as sexual abuse or chronic trauma experiences such as emotional neglect can occur during childhood (Briere & Conte, 1993; Chu et al., 1999). This effect has been noted in studies of adult samples and is consistent with conceptualizations of the function dissociation serves in the trauma response (Briere & Conte, 1993; Chu et al., 1999; Seng, D'Andrea, & Ford, 2014). Some studies and case narratives have also described turning points where dissociation fails in the face of a trigger and memory emerges, and with it delayed onset of PTSD and continued dissociative symptomology (van der Kolk & Fisler, 1995). Although additional studies are needed to confirm this explanation, it is possible that highly dissociative youth have unrecalled trauma histories and thus require trauma-specific treatment and trauma-informed care (Seng, D'Andrea, & Ford, 2013).

Model A demonstrates that including the two dissociative symptoms of depersonalization and derealization elucidates the high PTSD, dissociative subtype group (class 1A) identified with adults and that depersonalization and derealization should continue to be studied with youth (Wolf et al., 2012b). This model also indicated that the moderate PTSD sub-group (classes 3A and 4A) is best separated into two classes distinguished by anxiety versus dysphoria (Elhai et al., 2013). Model B demonstrates that the high PTSD sub-group (classes 1B and 2B) should be separated into two classes distinguished by a wide array of dissociative symptoms, not only depersonalization and derealization—and that the more moderate PTSD sub-group may be better characterized by two classes that represent anxious arousal but are distinguished by dysphoria including dissociative amnesia, emotional detachment, and numbing.

There are strengths and limitations to this study that require consideration in interpreting the results. The study findings were consistent with prior studies demonstrating that depersonalization and derealization are less common among children than adults, possibly due to the difficulty of describing these phenomena, and that dissociation is a common coping mechanism for trauma-exposed children that becomes less common across child development and ultimately over the lifespan (Brunner et al., 2000; Coons, 1996; Shimizu & Sakamoto, 1986; Tolumen et al., 2007). The study used a large, ethnoracially diverse sample of trauma-exposed adolescents. The study was limited in that it did not include older adolescents ages 17 or 18 and that it used a *DSM-IV* measure of PTSD due to constraints of the dataset, which was constructed prior to the publication of the *DSM-5* (APA, 2000; APA, 2013). It also did not elucidate how dissociation may appear in youth under age 12, another important age group to consider in future research studies.

This study demonstrates that while the *DSM-5* dissociative subtype of PTSD captures an important subset of PTSD cases, there are additional prominent dissociation symptoms—some of which are more prominent than depersonalization/derealization—that would be optimal to assess for in adolescents. While PTSD-D can be distinguished from PTSD alone in adolescents, a wider range of dissociative symptoms is needed in order to fully characterize the co-occurrence and expression of PTSD and dissociative symptoms. Important symptoms of dissociation in the models were daydreaming, dissociative amnesia, and dissociative avoidance. There was a unique subgroup of adolescents (class 3B, dissociative amnesia and detached arousal) that was symptomatic for dissociation and in particular dissociative amnesia, but less symptomatic for PTSD and behavioral symptoms. The role of dissociation in auto-attenuating trauma-related distress and obscuring recall of trauma experiences requires further study in the future. Research

and clinical focus on this phenomenon may be valuable since the presence of both dissociation and PTSD results in the highest burden of symptoms and residence outside the home for adolescents. If adolescence represents a crucial moment in the life history of pathological traumatic stress responses, it may be a pivotal point for intervention.

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Table 21: Statistical Fit Indices for Model A

Model A	BIC	SSA BIC	AIC	VLMR LRT	AdLMR LRT	Entropy
2 Class	80543.4	80387.7	80247.7	-46870.3**	13523.5**	0.90
3 Class	78264.9	78029.7	77818.4	-40074.9**	2467.0**	0.85
4 Class	77886.9	77575.4	77289.7	-38835.2**	575.9**	0.80
5 Class	77613.9	77219.9	76865.8	-38545.8**	471.5**	0.77
6 Class	77543.5	77543.5	76644.6	-38308.9	269.9	0.75
7 Class	77595.6	77042.7	76545.8	-38173.3	148.0	0.74

*Value is significant at the 0.05 level.

**Value is significant at the 0.01 level.

Table 22: Statistical Fit Indices for Model B

Model B	BIC	SSA BIC	AIC	VLMR LRT	AdLMR LRT	Entropy
2 Class	103576.2	103369.7	103184.1	-59809.5**	16502.7**	0.92
3 Class	100746.4	100435.0	100155.2	-51527.0**	3083.3**	0.87
4 Class	100040.1	99623.9	99249.8	-49979.6**	967.7**	0.83
5 Class	99463.4	98942.3	98474.0	-49493.9**	838.6**	0.82
6 Class	99281.1	98655.2	98092.6	-49073.0**	445.7**	0.79
7 Class	99249.0	98518.2	97861.4	-48849.3	296.1	0.78

*Value is significant at the 0.05 level.

**Value is significant at the 0.01 level.

Figure 4: Model A Latent Class Analysis

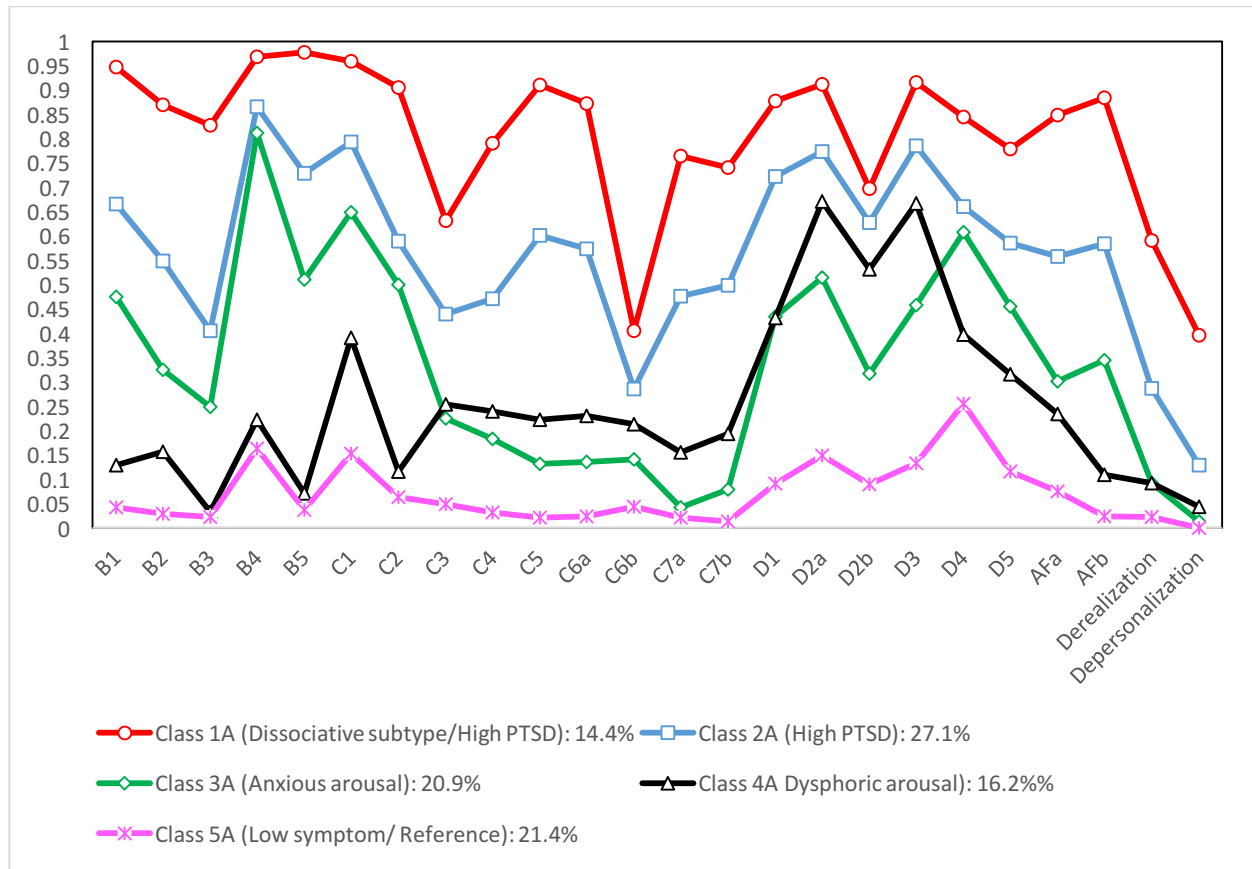


Figure 5: Model B Latent Class Analysis

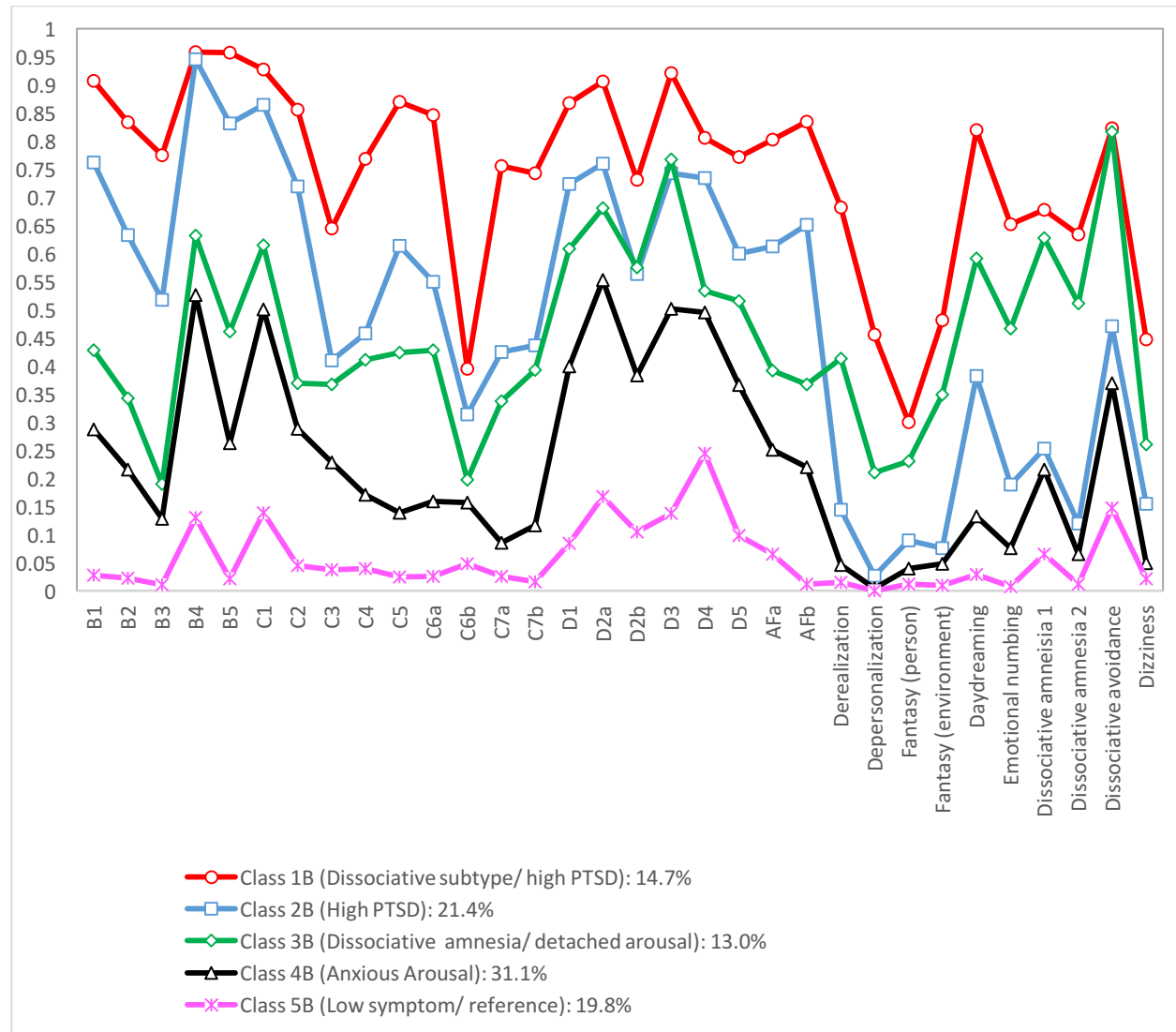


Table 23: R3Step for Model A

N (%)	Overall	Class 1A: Dissociative subtype/high PTSD	Class 2A: High PTSD	Class 3A: Anxious arousal	Class 4A: Dysphoric Arousal	Class 5A: Low symptom/ reference
Neither	2026 (100.0)	0 (0.0)	324 (16.0)	604 (29.8)	452 (22.3)	646 (31.9)
PTSD-D	394 (100.0)	329 (83.4)	65 (16.6)	0 (0.0)	0 (0.0)	0 (0.0)
Dissociation	321 (100.0)	0 (0.0)	202 (62.9)	54 (16.9)	56 (17.3)	10 (3.0)
PTSD	340 (100.0)	132 (38.9)	208 (61.1)	0 (0.0)	0 (0.0)	0 (0.0)

Table 24: R3Step for Model B

N (%)	Overall	Class 1B: Dissociative subtype/high PTSD	Class 2B: High PTSD	Class 3B: Dissociative amnesia/ detached arousal	Class 4B: Anxious arousal	Class 5B: Low symptom/ reference
Neither	2026 (100)	0 (0.0)	318 (15.7)	160 (7.9)	946 (46.7)	602 (29.7)
PTSD-D	394 (100)	351 (89.2)	24 (6.2)	19 (4.7)	0 (0.0)	0 (0.0)
Dissociation	321 (100)	25 (7.8)	43 (13.5)	215 (66.9)	29 (9.0)	9 (2.8)
PTSD	340 (100)	88 (25.8)	252 (74.0)	1 (0.2)	0 (0.0)	0 (0.0)

Table 25: Demographic Comparison for Model A

N (%)	Overall 3081 (100.0)	Class 1A: Dissociative subtype/high PTSD 445 (14.4)	Class 2A: High PTSD 835 (27.1)	Class 3A: Anxious arousal 643 (20.9)	Class 4A: Dysphoric Arousal 500 (16.2)	Class 5A: Low symptom/ reference 658 (21.4)	⁺ X ² / ⁺⁺ F
Demographics							
Age (years) M(SD)	14.5 (1.45)	14.75 (1.38)	14.55 (1.46)	14.48 (1.45)	14.57 (1.42)	14.25 (1.47)	8.99 ⁺⁺⁺
Female gender	1863 (60.5)	337 (75.7)	579 (69.3)	399 (62.1)	249 (49.8)	299 (45.4)	172.55 ⁺⁺⁺
Male gender	1218 (39.5)	108 (24.3)	256 (30.7)	244 (37.9)	251 (50.2)	359 (54.6)	94.32 ⁺⁺⁺
White	998 (32.4)	135 (30.3)	298 (35.7)	202 (31.4)	166 (33.2)	197 (29.9)	6.71 ⁺
Black	705 (22.9)	92 (20.7)	189 (22.6)	160 (24.9)	99 (19.8)	165 (25.1)	5.28 ⁺
Hispanic	1136 (36.9)	162 (36.4)	307 (36.8)	227 (35.3)	173 (34.6)	267 (40.6)	3.05 ⁺
Other	184 (6.0)	31 (7.0)	47 (5.6)	33 (5.1)	37 (7.4)	36 (5.5)	5.20 ⁺
Residence							
Parents	1925 (62.5)	260 (58.4)	530 (63.5)	392 (61.0)	314 (62.8)	429 (65.2)	3.90 ⁺
Relatives	364 (11.8)	44 (9.9)	107 (12.8)	81 (12.6)	57 (11.4)	75 (11.4)	2.36 ⁺
Foster care	275 (8.9)	40 (9.0)	76 (9.1)	52 (8.1)	37 (7.4)	70 (10.6)	3.62 ⁺
Residential treatment	218 (7.1)	47 (10.6)	73 (8.7)	41 (6.4)	36 (7.2)	21 (3.2)	27.75 ⁺⁺⁺
Other	122 (4.0)	17 (3.8)	32 (3.8)	23 (3.6)	18 (3.6)	32 (4.9)	1.68

Insurance							
None	811 (26.3)	110 (24.7)	222 (26.6)	158 (24.6)	126 (25.2)	195 (29.6)	2.64 ⁺
Private	351 (11.4)	54 (12.1)	106 (12.7)	67 (10.4)	55 (11.0)	69 (10.5)	2.90 ⁺
Public	1885 (61.2)	261 (58.7)	515 (61.7)	406 (63.1)	297 (59.4)	406 (61.7)	3.58 ⁺
Both	34 (1.1)	5 (1.1)	12 (1.4)	1 (0.2)	5 (1.0)	11 (1.7)	7.58 ⁺

*Value is significant at the 0.05 level.

**Value is significant at the 0.01 level.

Table 26: Trauma and Symptom Comparison for Model A

	Overall 3081 (100.0)	Class 1A: Dissociative subtype/high PTSD 445 (14.4)	Class 2A: High PTSD 835 (27.1)	Class 3A: Anxious arousal 643 (20.9)	Class 4A: Dysphoric Arousal 500 (16.2)	Class 5A: Low symptom/ reference 658 (21.4)	⁺ X ² / ⁺ F
Trauma History							
Trauma before age 6	906 (29.4)	148 (33.3)	275 (32.9)	170 (26.4)	139 (27.8)	174 (26.4)	15.22 ⁺ **
Sexual abuse	797 (25.9)	142 (31.9)	257 (30.8)	173 (26.9)	97 (19.4)	128 (19.5)	45.23 ⁺ **
Physical Abuse	1037 (33.7)	181 (40.7)	321 (38.4)	204 (31.7)	149 (29.8)	182 (27.7)	36.90 ⁺ **
Emotional abuse	1337 (43.4)	220 (49.4)	416 (49.8)	257 (40.0)	216 (43.2)	228 (34.7)	50.41 ⁺ **
Neglect	816 (26.5)	114 (25.6)	223 (26.7)	165 (25.7)	128 (25.6)	186 (28.3)	0.23 ⁺
Trauma count M(SD)	3.85 (2.42)	4.57 (2.73)	4.2 (2.64)	3.75 (2.2)	3.81 (2.26)	3.09 (1.96)	32.52 ⁺⁺ **
Maltreatment count M(SD)	1.14 (1.28)	1.38 (1.34)	1.31 (1.33)	1.09 (1.28)	1.05 (1.2)	0.91 (1.16)	14.05 ⁺⁺ **
Psychopathology							
PTSD count M(SD)	8.41 (5.39)	16.87 (1.67)	12.18 (2.07)	7.26 (1.97)	5.73 (1.82)	1.54 (1.22)	5721.00 ⁺⁺⁺ **
Dissociation count M(SD)	2.28 (2.38)	5.21 (2.58)	3.06 (2.17)	1.64 (1.64)	1.62 (1.77)	0.49 (0.86)	480.10 ⁺⁺⁺ **
Externalizing behavior M(SD)	62.4 (11.94)	64.88 (11.21)	63.35 (11.65)	60.77 (12.65)	64.42 (10.54)	59.64 (12.23)	19.12 ⁺⁺ **
Internalizing behavior M(SD)	62.4 (12.21)	67.2 (11.94)	64.22 (11.13)	60.94 (12.0)	62.62 (10.72)	58.19 (13.0)	40.55 ⁺⁺ **

*Value is significant at the 0.05 level.

**Value is significant at the 0.01 level.

Table 27: Comparison of Demographics for Model B

	Overall 3081 (100.0)	Class 1B (Dissociative subtype/high PTSD) 453 (14.7)	Class 2B (High PTSD) 658 (21.4)	Class 3B (Dissociative amnesia/ detached arousal) 401 (13.0)	Class 4B (Anxious arousal) 958 (31.1)	Class 5B (Low symptom/ reference) 611 (19.8)	⁺ X ² / ⁺⁺ F
Demographics							
Age M(SD)	14.5 (1.45)	14.74 (1.38)	14.63 (1.46)	14.49 (1.48)	14.48 (1.45)	14.23 (1.46)	9.58 ^{++**}
Female gender	1863 (60.5)	346 (76.4)	486 (73.9)	240 (59.9)	530 (55.3)	261 (41.7)	192.24 ^{++**}
Male gender	1218 (39.5)	107 (23.5)	172 (26.1)	161 (40.1)	428 (44.7)	350 (57.3)	115.00 ^{++**}
White	998 (32.4)	152 (33.6)	234 (35.6)	130 (32.4)	299 (31.2)	183 (30.0)	6.478 ⁺
Black	705 (22.9)	93 (20.5)	142 (21.6)	88 (21.9)	228 (23.8)	154 (25.2)	4.06 ⁺
Hispanic	1136 (36.9)	167 (36.9)	236 (35.9)	130 (32.4)	364 (38.0)	239 (39.1)	3.01 ⁺
Other	184 (6.0)	33 (7.3)	37 (5.6)	27 (6.7)	59 (6.2)	28 (4.6)	4.61 ⁺
Residence							
Parents	1925 (62.5)	273 (60.3)	402 (61.1)	254 (63.3)	608 (63.5)	388 (63.5)	8.59 ⁺
Relatives	364 (11.8)	47 (10.4)	83 (12.6)	43 (10.7)	121 (12.6)	70 (11.5)	1.81 ⁺
Foster care	275 (8.9)	43 (9.5)	68 (10.3)	26 (6.5)	76 (7.9)	62 (10.1)	5.90 ⁺
Residential treatment	218 (7.1)	52 (11.5)	64 (9.7)	17 (4.2)	64 (6.7)	21 (3.4)	35.19 ^{++**}

Other	122 (4.0)	15 (3.3)	20 (3.0)	19 (4.7)	39 (4.1)	29 (4.7)	4.52 ⁺
Insurance							
None	811 (26.3)	115 (25.4)	183 (27.8)	97 (24.2)	240 (25.1)	176 (28.8)	3.63 ⁺
Private	351 (11.4)	59 (13.0)	74 (11.2)	52 (13.0)	107 (11.2)	59 (9.7)	5.19 ⁺
Public	1885 (61.2)	275 (60.7)	398 (60.5)	227 (56.6)	611 (63.8)	374 (61.2)	2.71 ⁺
Both	34 (1.1)	5 (1.1)	7 (1.1)	6 (1.5)	8 (0.8)	8 (1.3)	1.66 ⁺

*Value is significant at the 0.05 level.

**Value is significant at the 0.01 level.

Table 28: Comparison of Trauma History and Psychopathology for Model B

	Overall 3081 (100.0)	Class 1B (Dissociative subtype/high PTSD) 453 (14.7)	Class 2B (High PTSD) 658 (21.4)	Class 3B (Dissociative amnesia/detached arousal) 401 (13.0)	Class 4B (Anxious arousal) 958 (31.1)	Class 5B (Low symptom/ reference) 611 (19.8)	⁺ X2/ ⁺⁺ F
Trauma History							
Trauma before age 6	906 (100.0)	152 (33.6)	220 (33.4)	117 (29.2)	264 (27.6)	152 (24.9)	16.90 ⁺⁺ *
Sexual abuse	797 (100.0)	135 (29.8)	240 (36.5)	96 (23.9)	220 (23.0)	106 (17.3))	68.82 ⁺⁺ *
Physical Abuse	1037 (100.0)	182 (40.2)	265 (40.3)	126 (31.4)	309 (32.3)	155 (25.4)	41.54 ⁺⁺ *
Emotional abuse	1337 (100.0)	227 (50.1)	344 (52.3)	171 (42.6)	395 (41.2)	200 (32.7)	62.70 ⁺⁺ *
Neglect	816 (100.0)	112 (24.7)	188 (28.6)	99 (24.7)	257 (26.8)	160 (26.2)	2.24 ⁺
Trauma count M(SD)	3.85 (2.4)	4.25 (3.0)	4.12 (3.0)	3.63 (3.0)	3.47 (3.0)	2.78 (1.5)	37.80 ⁺⁺⁺ *
Maltreatment count M(SD)	1.14 (1.3)	1.31 (1.32)	1.44 (1.4)	1.16 (1.2)	1.04 (1.2)	0.87 (1.1)	20.26 ⁺⁺⁺ *
Psychopathology Symptoms							
PTSD Symptom count M(SD)	8.41 (5.4)	16.34 (2.0)	12.7 (2.3)	9.19 (2.4)	6.04 (2.1)	1.42 (1.2)	4379.00 ⁺⁺⁺
Dissociation count M(SD)	2.28 (2.4)	6.05 (1.9)	1.91 (1.2)	4.66 (1.6)	1.05 (1.0)	0.32 (0.6)	1871.00 ⁺⁺⁺
Externalizing behavior M(SD)	62.4 (11.9)	65.13 (11.3)	62.3 (11.5)	63.05 (12.5)	62.83 (11.7)	59.37 (12.3)	14.37 ⁺⁺⁺ *
Internalizing behavior M(SD)	62.4 (12.2)	67.08 (11.9)	63.84 (11.2)	63.6 (11.9)	61.39 (11.2)	58.19 (13.2)	36.49 ⁺⁺⁺ *

*Value is significant at the 0.05 level.

**Value is significant at the 0.01 level.

CHAPTER 5: Conclusion

This study illuminates and characterizes the complex relationships between trauma, dissociation, and posttraumatic stress in an adolescent population, a group that has been understudied in relation to adults. A theory of complex trauma and self-dysregulation was used to inform the development of this study, and in the end, self-dysregulation was operationalized as PTSD and dissociation according to the *DSM-5* to examine the validity of those criteria. Ultimately, the study results indicated that trauma itself, rather than PTSD or dissociation, was associated with service usage complexity. The study also illustrates some of the specific ways PTSD and dissociation co-occur among youth.

The theoretical framework and proposed relationships among constructs for this study was supported only in part. There were relationships between trauma history and service utilization patterns, but PTSD and dissociation did not play a role in that relationship. This finding may be due to the way self-dysregulation was operationalized somewhat narrowly as PTSD and dissociation according to the *DSM-5* diagnostic criteria (APA, 2013). Those specific diagnoses may not be sensitive enough to capture youth affected by trauma-related self-dysregulation. Prior studies with youth have demonstrated that youth often do not reach the diagnostic threshold for PTSD, but are nevertheless highly symptomatic and experience significant functional impairment (Adams et al., 2016; Cecil et al., 2017; Turner, Finkelhor, & Ormrod, 2006). A broader conceptualization of self-dysregulation may be needed to fully assess relationships between the proposed constructs in this study's theoretical framework more fully.

In the course of analyzing and interpreting the findings of the primary study aims around trauma, PTSD/dissociation, and service utilization, two post-hoc aims were added to more comprehensively characterize how PTSD and dissociation co-occur among youth, beyond just depersonalization and derealization. The results of these post-hoc aims illuminate some of the ways alterations in consciousness as a manifestation of complex trauma affect the expression of PTSD symptoms and provide support for the prominence of dissociative coping in youth and its protective function in relation to traumatic stress (Herman, 1992).

The study revealed that PTSD and dissociation co-occur among trauma-exposed adolescents at much higher rates than they do among adults. These findings about dissociation are consistent with prior studies demonstrating that dissociation is a common coping mechanism for trauma-exposed children that becomes less common across child development and in adulthood (Brunner et al., 2000; Coons, 1996; Shimizu & Sakamoto, 1986; Tolumen et al., 2007). Using this lifecourse trajectory evidence, it follows that adolescents would be more dissociative than adults, and the current study revealed that the dissociative subtype of PTSD was prevalent for 53.7% of PTSD cases, compared with 14.4% of adult cases (Stein et al., 2013). This effect has been noted in studies of adult samples and is consistent with conceptualizations of the function dissociation serves in the trauma response (Briere & Conte, 1993; Chu et al., 1999; Seng, D'Andrea, & Ford, 2014). Dissociation serves a protective function for children exposed to severe traumatic stressors such as maltreatment (International Society for the Study of Trauma and Dissociation [ISSTD], n.d.). It allows psychological escape and attenuates trauma-related distress when no other escape is possible, as is commonly the case when the source of the trauma is in the home environment from experiences like sexual or physical abuse from family members or caregivers, emotional or physical neglect, inconsistent or unpredictable

parenting, parental substance abuse or mental illness, or domestic violence exposure. The findings from this study about the high rates of dissociation among adolescents with PTSD helps fill the gap between what is known about young children exposed to trauma and adult sequelae.

While these findings about the dissociative subtype of PTSD are consistent with what is already known about these phenomena and contribute to that evidence base, it is important to situate these findings within a balanced perspective of the strengths and limitations of the *DSM-5* conceptualization of PTSD and dissociation (American Psychiatric Association, 2013). Only 23.3% of the sample qualified for a PTSD diagnosis, and the other 76.7% of the sample was still symptomatic for internalizing and externalizing behavior problems, dissociation, and PTSD symptoms, despite not reaching the diagnostic threshold for PTSD. The non-PTSD portion of the sample had high rates of exposure to maltreatment trauma and trauma during early childhood and a mean of four trauma exposures and one maltreatment trauma exposure. These findings suggest that PTSD diagnosis alone may not find all cases of symptomatic children needing treatment and trauma-related functional impairment should be understood more broadly for adolescents.

Another finding that was somewhat surprising was that adolescents in the dissociative subtype group were very similar to those in the PTSD-only group in terms of trauma exposures. This is a contrast to adult studies, where individuals in the dissociative subtype group had higher rates of child sexual maltreatment and adult sexual trauma (Wolf et al., 2012a; Wolf et al., 2012b). One possible explanation for the similarity between the PTSD-D and PTSD-only groups is that the dissociation symptoms of depersonalization and derealization capture a less specific portion of cases of dissociation co-occurring with PTSD than these dissociation symptoms would in an adult population. Prior studies have demonstrated that depersonalization and derealization are less common among children than adults, possibly due to the difficulty of describing these

phenomena, and that dissociation is a common coping mechanism for trauma-exposed children that becomes less common across child development and ultimately over the lifespan (Brunner et al., 2000; Coons, 1996; Shimizu & Sakamoto, 1986; Tolumen et al., 2007). Other dimensions of posttraumatic dissociation have been identified among adolescents, including amnesia and loss of conscious control in addition to depersonalization/derealization (Kerig et al., 2016). Another possible explanation is that the presence of depersonalization/derealization is a signal of the presence of dissociative coping more broadly that is attenuating distress and also ability to recall trauma, thereby obscuring symptoms and number of reported trauma exposures (Seng, D'Andrea, & Ford, 2014).

The two post-hoc aims were added to this study to follow up on these findings regarding trauma, PTSD, and dissociation. The first aim, to examine the latent structure of PTSD and depersonalization/derealization, replicated an important adult study of the subtype that provided evidence for its eventual inclusion in the *DSM-5* (Wolf et al., 2012b). The second aim, to examine the co-occurrence of PTSD and dissociation using a broader set of dissociation symptoms, was intended to better characterize PTSD and dissociation among adolescents and to consider whether other dissociation symptoms played a role in posttraumatic stress expression.

The first model (Model A, depersonalization/derealization model) revealed some differences in how depersonalization/derealization present in PTSD for adolescents versus adults. In adult studies, there were notable trauma differences between the dissociative subtype group and the group with high PTSD, but no dissociation. The dissociative subtype had more flashbacks, childhood sexual abuse, and adult sexual trauma than individuals in the high PTSD alone group (Wolf et al., 2012a; Wolf et al., 2012b). However, in the depersonalization/derealization model, the dissociative subtype group and high PTSD-only group

did not differ on trauma exposures, but had more somatic symptoms, avoidance of people, places, or things that were reminders of the trauma, sense of foreshortened future, trauma-related guilt, and overall dissociation symptoms. The PTSD symptom profile for adolescents with the PTSD dissociative subtype appears to differ from that of adults, and number and characteristics of trauma exposures was not a significant variable in class differences the way it was for adults.

The second model (Model B, expanded dissociation model) which expanded the set of dissociation symptoms from two symptoms to ten symptoms may clarify the first model. In this model, there were two high dissociation classes: a high PTSD/high dissociation group, and a low PTSD/high dissociation group characterized specifically by relatively high probability of dissociative amnesia. These two high dissociation classes did not differ on maltreatment exposures, but the high dissociation/high PTSD class had more overall trauma exposures than the dissociative amnesia class and an average of seven more PTSD symptoms. Including a broader set of dissociation symptoms in this model provides additional information about how dissociation functions in adolescents with trauma exposure and provides additional support for the hypothesis that dissociation may be attenuating trauma-related distress and obscuring recall of traumatic experiences. This model also indicated that depersonalization and derealization were not the most prominent symptoms of dissociation for adolescents; the likelihood of depersonalization was particularly low across all groups. Instead, derealization, daydreaming, dissociative amnesia, and dissociative avoidance were the most prominent dissociation symptoms in all groups. These symptoms are consistent with the function of dissociation as a coping mechanism in the face of overwhelming trauma and fit with the ways youth might manage traumatic stress in contrast to adults (ISSTD, n.d.). For example, because behavioral avoidance of trauma triggers may be less possible for youth than it is for adults, dissociative

avoidance might be the best available option for youth to manage trauma-related distress. While the *DSM-5* dissociative subtype of PTSD captures an important subset of PTSD cases, this model demonstrates that there are additional prominent dissociation symptoms—some of which are more prominent than depersonalization/derealization—that require attention in clinical treatment and research with adolescents.

The service utilization aim of this study was less directly interconnected than the others, but nevertheless provides important information about service utilization and help seeking related to trauma, PTSD, and dissociation. Most adolescents appeared to be accessing at least two service systems prior to receiving trauma treatment services at an NCTSN site. There were three high service usage classes: (1) multi-system intensive service users, (2) justice users, and (3) multi-system low intensity/community service users. Adolescents in all three groups had the highest levels of socioeconomic risk and were more likely to be living in residential treatment than adolescents in other groups. The two multi-system user groups had the highest numbers of trauma exposures and maltreatment trauma exposures and were more likely to be female, while the justice users were more likely to be male. Trauma history and sociodemographic factors contributed to group differences in pattern complexity, but psychopathology symptoms did not. This finding was unexpected; because many individuals who experience trauma are resilient and do not go on to develop psychopathology, the most logical finding would have been that psychopathology rather than maltreatment itself explained group differences in help-seeking and service utilization. A possible explanation for this finding is that other behavioral or emotional disorders or symptom patterns not modeled in this study played a role in service-seeking. Youth who experience maltreatment often do not reach the diagnostic threshold for PTSD despite being highly symptomatic for emotional and behavioral problems, and PTSD diagnosis itself may not

have been the most important factor in service seeking for this sample (Adams et al., 2016; Cecil et al., 2017; Turner, Finkelhor, & Ormrod, 2006). If the *DSM-5* conceptualization of PTSD does not fully capture the symptoms and functional impairment related to maltreatment, it would follow that service utilization by adolescents experiencing functional impairment and trauma-related distress as a result of maltreatment might be better predicted by maltreatment itself rather than PTSD or dissociation diagnosis. (Cloitre et al., 2009; D’Andrea et al., 2009; Herman, 1992; van der Kolk et al., 2009). By identifying patterns of service utilization specifically related to traumatic stress, this study clarifies how trauma and trauma-related distress affect adolescent functioning and help-seeking and indicates that maltreatment trauma itself, rather than its subsequent psychopathology, is the most important factor in determining service usage intensity and complexity.

This study has several strengths and limitations that should be taken into account in understanding and interpreting the results. The study used a large, diverse clinical sample with valid reliable measures. The findings of the study support existing literature and contribute to the growing evidence base on traumatic stress and dissociation among adolescents. There are some limitations to this study as well. The study used a *DSM-IV* measure of PTSD due to constraints of the dataset and a self-report measure of dissociation. This study used a treatment-seeking, clinical sample of trauma-exposed adolescents in the US, and as such, the results of this study are only generalizable to that population. The CDS sample was disproportionately more female than male and had low numbers of older (17- and 18-year-old) adolescents. Demographic trends of child abuse and neglect cases in the US indicate that (1) girls experience maltreatment at higher rates than boys, and (2) the highest number of maltreatment cases occur for children less than one year of age, and then incrementally decrease from age one to age seventeen (DHHS, 2016).

Overall, these trends held true for the sample, and the fact that the ratio of females to males was slightly higher in this study than what child abuse and neglect reports indicate may be due to the broad range of types of trauma exposures youth seeking NCTSN services experienced, beyond just abuse and neglect. It is also possible that some youth were seeking treatment for recent trauma exposures that were not maltreatment, but that those same youth had untreated or undisclosed maltreatment exposures in their pasts.

There were not sufficient data present in the CDS and/or the CDS did not assess additional socioeconomic status indicators (e.g., family income, parent education), and as such, insurance status was the only available indicator of socioeconomic risk. Trauma symptoms and trauma exposures not recorded during the intake process were assumed to be not present, which might have underestimated some exposures or symptoms. The data on service utilization were only recorded for the 30 days prior to treatment seeking, limiting conclusions that can be drawn on longer-term utilization. It is also possible that the patterns may have been different if utilization had been assessed prior to 30 days. The TSCC-A dissociation subscale relies on adolescent self-report of dissociation symptoms, and because dissociation is a difficult experience to conceptualize, the self-reports may not be reliable. Prior studies of adolescent dissociation have demonstrated good reliability and validity of self-report measures, however, adding confidence to the performance of the TSCCA-A in this study (Armstrong et al, 1997). The study only included adolescents ages 12 to 16 and not older or younger youth. The CDS only included 39 adolescents ages 17 or 18 (1% of the sample) meeting inclusion criteria for the study. This very small group of older adolescents was similar to the rest of the sample on all measures and was too small to make meaningful developmental comparisons among younger, middle, and older adolescents. The age range of 12 to 16 was consistent with the dissociation

outcome measure, the TSCC-A, which is designed to be used with children up to age 16, and the 17- and 18-year-old group demonstrated poor internal consistency reliability on this measure.

If this study were to be replicated without the limitations inherent to the dataset and project scope, several changes could be made to strengthen the results and conclusions. It would be optimal to use a *DSM-5* rather than *DSM-IV* measure of PTSD. The *DSM-5* contains structural changes to how PTSD is diagnosed and adds a fourth symptom cluster, alterations in mood and cognition, in addition to modifying the criterion A definition of a trauma exposure (APA, 2013). Additionally, a measure of complex PTSD would be useful to compare to the *DSM-5* definition of PTSD (Herman, 1992). Adding this measure might allow more conclusions to be drawn about the predictive value of PTSD versus complex PTSD for determining likely patterns of service utilization. Using a broader age range including preschool age, elementary age, and older adolescents ages 17 and 18 that could not be included in the current study would enhance the study results by providing a more cohesive picture of the developmental trajectory of co-occurring trauma, posttraumatic stress, and dissociation. A broader sample age range would allow more conclusions to be drawn about if and how dissociation changes over the lifespan. Finally, there are unique characteristics of the NCTSN sample because it is a treatment-seeking, clinical sample. Adolescents who are receiving treatment may differ from those who have experienced trauma but are not receiving services, and conducting parallel studies with community samples in highly exposed areas would allow the results to be more generalizable to a broader population.

To further this area of research, future studies should address some of the limitations and ideal study modifications described above. Replicating the study with a broader age range and with preschool and school-age children would clarify how PTSD and dissociation co-occur over

childhood and changes that occur with major developmental transitions, such as childhood to adolescence or adolescence to adulthood. Studies aimed towards understanding developmental trajectories of PTSD and dissociation across childhood would ideally be longitudinal in nature. Another important follow up study would be to expand investigation of the service utilization component of this study. This study demonstrated relationships between trauma history, trauma-related psychopathology (PTSD and dissociation), and patterns of service utilization. A follow-up study could also investigate how service utilization patterns are related to clinical and psychosocial outcomes. In this study, it would be useful to investigate other dimensions of service utilization and how they relate to outcomes. Prior studies of mental health service delivery have found that merely accessing services is not always enough to affect outcomes (Becker et al., 2015; Dawson & Berry, 2001). The following constructs of treatment engagement in mental health or social services have been found to be related to improved outcomes:

- Accessibility: Services are provided at convenient locations for the child and family; consideration is given to issues such as transportation or childcare that might inhibit access;
- Collaboration: There is active participation from the child and family in treatment planning, agreement with the treatment plan, and mutual goal setting;
- Cooperation: The child and family keep appointments, complete tasks, and cooperate with service providers;
- Cognitive engagement: Psychoeducation about services is provided, assessments are comprehensive, behaviors are modeled, and appropriate expectations are established; and

- Relationships with service providers: There is a sense of trust, empathy, alliance, and rapport from service providers with the child and family (Becker et al., 2015; Dawson & Berry, 2001).

Measuring these constructs along with specifying utilization of services might illuminate service delivery mechanisms and areas for system-level interventions to improve treatment for trauma survivors and provide treatment in ways that will maximize the likelihood of improved outcomes. Along with these dimensions of service utilization and treatment engagement, assessing the extent to which services and service organizations are trauma-informed might be another important service delivery domain for this population (Substance Abuse and Mental Health Services Administration [SAMHSA], n.d.). Although there are not currently any formal, validated measures of trauma-informed care, the key components of trauma informed care have been identified as:

- Safety: “Program efforts to ensure service users’ physical and emotional safety, meaning reasonable freedom from harm or danger, and to prevent further traumas from occurring;”
- Trustworthiness and transparency: “The extent to which an organization maintains transparency in its policies and procedures, with the objective of building trust among stakeholders such as staff, clients, and community members;”
- Collaboration: “Agency staff view service users as active partners and experts in their own lives, an approach often operationalized through the formal and informal use of peer support, such as peer mentoring;”
- Empowerment: “Efforts to share power with service users, giving them a strong voice in decision making at individual and agency levels;”

- Intersectionality: “Awareness of identity characteristics, such as race, gender, and sexual orientation, and the privileges or oppression these characteristics can incur” (Bowen & Murshid, 2016, pp. 224)

These components should be evaluated for service users who are trauma survivors, and eventually, it would be optimal to develop measure of trauma-informed care and trauma-informed organizations to include in service utilization and service delivery studies. Future studies should also investigate the role of other types of trauma exposure in the expression and development of posttraumatic stress and dissociative symptomology related to maltreatment trauma. Maltreatment tends to occur in constellation with other traumas (Kiesel et al., 2014; Pynoos et al., 2014). For example, traumatic bereavement is common among community samples and is one of the most common and most distressing types of trauma exposure in clinical samples (Pynoos et al., 2014). In the overall NCTSN CDS sample, 48.7% of children reported exposure to traumatic loss, bereavement, or separation, which included death of a family member or close friend or unexpected separation resulting from divorce, incarceration, hospitalization, or foster care placement (Pynoos et al., 2014). Evidence suggests that loss and grief reactions are associated with emotional and behavioral problems, sometimes more so than PTSD (Melhem et al., 2007). Thus, studying the impact of other trauma exposures and their effects on service utilization and outcomes is a needed step in future research studies.

Although there are some inherent limitations to the design and descriptive nature of this study, the findings have several implications for service professionals working with trauma-affected youth and for policy. First, the findings suggest that professionals working in the service sectors examined in this study—mental health, social services, juvenile justice, schools, and healthcare—are likely to come into contact with trauma-exposed youth, though the trauma may

or may not be disclosed and may or may not be acutely affecting function. Thus, trauma-informed care is warranted as a general practice for all of these types of organizations. Although it may be appropriate for some organizations and some communities to invest significant time and resources in trauma-informed service delivery, organizational processes, and staff training, all service professionals can incorporate some relatively simple techniques into their practice, starting with an attitudinal shift. Rather than viewing youth through a lens of risk, problems, and poor life choices, a trauma-informed lens asks what kinds of adversity the individual may have experienced that led to the adoption of maladaptive coping mechanisms (SAMHSA, n.d.). Trauma-informed care also requires that service professionals cultivate a sociological imagination, or an awareness of the interconnectedness of individual experiences and larger societal structures (Mills, 2000). Understanding the intergenerational nature of trauma and mental illness and the ways life experiences and social identities intersect to produce the whole person receiving services with their unique needs and vulnerabilities will lead to more trauma-informed practice.

Beyond this important first step of attitudinal shifts, there are other trauma-informed care practices service professionals can adopt, such as (1) being safe and trustworthy, (2) inviting disclosure and discussing the ways trauma history might be relevant to current care needs, (3) providing privacy and accommodating client preferences, (4) active listening, (5) avoiding victim blaming or making generalizations, (6) empowering clients to control their care and make choices as much as possible, and (7) understanding that there is no easy fix and that long-term therapeutic relationships and services might be needed using evidence-based treatments and other evidence-based interventions (Choi & Seng, 2014).

The findings of this study also suggest that comprehensive assessment of the ways trauma might be affecting youth, beyond just PTSD and its dissociative subtype, is needed in trauma treatment settings. Assessment of dissociation and emotional and behavioral problems, which were examined in this study, are two important domains to start with. Dissociation in particular can be easy to miss, and service professionals should be aware of the protective function dissociation serves and understand that although those youth may not appear to be in distress, dissociation is a warning sign and may suggest that intervention is needed. Clinicians should also be aware that symptomatic youth who are experiencing significant functional impairment may not necessarily reach the threshold for a PTSD diagnosis, but may nevertheless need support and treatment services related to trauma.

In terms of policy implications, this study suggests that resources should be put toward developing support for trauma-informed care specific to different service delivery sectors. Trauma-informed care in healthcare might look different from trauma-informed care in juvenile justice, and although some service sectors have begun to work toward more trauma-informed service delivery (e.g., substance abuse, mental health), this paradigm is not consistently implemented in all communities or organizations. Local, state, and national policies should establish evidence-based standards of care for trauma-informed service delivery. Additionally, not all service sectors have fully explored what trauma-informed service delivery looks like for their specific client population. Providing resources for trauma-informed care and eventually developing policies for when, where, and how trauma-informed care should be implemented specific to each service sector is an important consideration for policymakers at all levels. This work also suggests that additional resources should be devoted to research on diagnosis and treatment of trauma-related disorders associated with complex trauma among youth. Current

diagnostic frameworks appear to be limited for complex trauma manifestations and for youth in particular, and modifying these frameworks may be a needed policy step in the future as research points to more appropriate directions for diagnosis and treatment for this population.

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AFTERWARD

This research study demonstrates that posttraumatic stress and dissociation co-occur in developmentally unique ways among adolescents. It also indicates that trauma itself, rather than trauma-related psychopathology as defined by the *DSM-5*, predict complex patterns of service utilization. Although there are a variety of possible interpretations of the study findings, as described above, I believe the findings of developmental differences in the expression of traumatic stress and dissociation combined with the findings around service utilization mean that our ways of diagnosing—and ultimately, treating—trauma-related mental illness are missing some youth affected by complex trauma exposures and not addressing the multiple types of self-dysregulation that occurs as a result of this kind of trauma exposure. Traumatic stress symptoms are one domain of impairment that remains important to assess, and adding dissociation co-occurring with PTSD is a step in the right direction to capturing the many ways youth are affected by complex trauma. However, as this study demonstrated, dissociation can be much more broad than only depersonalization/derealization. In the end, these data indicate that there is a need to more comprehensively assess the impact of early, chronic trauma exposure on youth, beyond only PTSD or its dissociative subtype. The data also suggest to service professionals that asking about trauma history and childhood adversity and then using a person-centered approach to identify client needs might be more fruitful than relying only on psychiatric diagnoses. From a mental health research perspective, we should be examining broader symptom constellations and refining psychiatric diagnoses, but as that research is still emerging, service professionals should

prioritize using a trauma-informed approach to meet client needs in any functional domain, regardless of whether or not diagnosed psychopathology is present.

Ultimately, our understanding of how complex trauma affects youth—including how we assess the effects of trauma on the lives of youth and how we diagnosis trauma-related disorders—will inform the treatments we develop and how we deliver services. Using a broad theory of trauma-related self-dysregulation to inform such development will create the most potential for positive outcomes and resilient social trajectories in the lives of youth.

APPENDICES

Appendix A: Data Use Agreement

NCTSN

The National Child
Traumatic Stress Network

National Center for Child Traumatic Stress
Department of Psychiatry and Behavioral Sciences
Duke University School of Medicine
411 West Chapel Hill Street, Ste 200
Durham, NC 27701

August 5, 2015

Kristen R. Choi
University of Michigan, School of Nursing
Ann Arbor, MI 48109

RE: Data Transfer Agreement for NCTSN Core Data Set (CDS)

Dear Ms. Choi,

We are pleased to inform you that the NCTSN Publication Review Committee has approved your request for limited access to a data set from the National Center for Child Traumatic Stress for use in your research project "Service use typologies among trauma-exposed children: The roles of PTSD and dissociation". The data will be provided in deidentified and anonymized form; that is, it will have all HIPAA identifiers removed, and will not contain any link fields allowing anyone to make connections back to individual subjects or community treatment centers in which the data were collected.

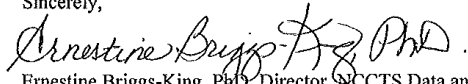
In order to provide this data we must ask that you agree to the following:

- a) You agree to use the dataset only for the project described above.
- b) You agree to the additional terms regarding access to the data established by members of the NCCTS Data and Evaluation Program for you dissertation research (use of output tables; use of CDS statistical guidance and support materials; provide drafts for review prior to final submission; and limited onsite access to the data set)
- c) You will not license, sell, or otherwise distribute the dataset to any third party; however, you may provide access to the dataset to bona fide collaborators for the purposes of your research project.
- d) You will not attempt to identify or contact any individuals from whom the data was collected.
- e) You agree to comply with the National Child Traumatic Stress Network's Guidelines for Publication and Data Use in all publications based upon this dataset. Those guidelines are available on the NCTSN Intranet, Data and Evaluation Program's page or via this link <https://share.nctsn.org/data/default.aspx>.
- f) All publications will acknowledge the National Center for Child Traumatic Stress at Duke University as the provider of the data, and shall also acknowledge support from SAMSHA in accordance with the guidelines.

Duke shall have the right immediately to terminate this agreement if you breach any of these provisions, and such breach is not cured within thirty days of receipt of written notice from Duke. Upon termination for any reason, you shall immediately cease use of the dataset, and return the dataset to Duke or, if Duke requests, destroy the dataset and provide Duke with written certification of such destruction.

We wish you the best success with this research project.

Sincerely,

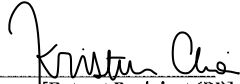


Ernestine Briggs-King, PhD, Director, NCCTS Data and Evaluation Program

NCTSN Data and Evaluation Team

AGREED:

I have read the National Child Traumatic Stress Network Guidelines for Publications and Data Use and agree to comply with those guidelines and the provisions of this letter agreement:



Name: [Dataset Recipient (PI)]

Title: PhD Student

Organization: University of Michigan School of Nursing

cc: NCTSN Publication Committee, NCCTS Co-Directors, Julian Ford PhD, Julia Seng PhD, CNM, FAAN

Appendix B: Data Analysis Plan

Analytic Process Steps	Decisions and Notes
<p>1. Discuss proposal and statistical software options with NCTSN statistician</p>	<ul style="list-style-type: none"> • Which software to use for which analyses? <ul style="list-style-type: none"> ○ SAS ○ R ○ Mplus • Clarify questions or issues with analytic plan. <ul style="list-style-type: none"> ○ Trauma: Confirmed only or confirmed v. suspected for trauma history ○ Subscales for PTSD, Briere, CBCL <ul style="list-style-type: none"> ▪ CBCL: Internalizing, externalizing, total ▪ Dichotomous for clinical cutoff ▪ SAS program ‘starter’ : library names, calling SAS code and formats ▪ Created variables: Race (white, black, Hispanic, other); insurance (public/private/none), maltreatment (yes/no) ▪ Formats in formats folder ▪ Complete case analysis for missing ▪ Generally no problem with not missing at random
<p>2. Select and subset sample based on inclusion/exclusion criteria</p> <ul style="list-style-type: none"> a. Ages 12-18 b. Baseline data available c. Trauma history data available 	<ul style="list-style-type: none"> • Sample should be approximately 4,537 based on preliminary frequencies
<p>3. Construct variables</p>	<ul style="list-style-type: none"> • Maltreatment <ul style="list-style-type: none"> ○ 1: Neglect, emotional abuse, physical abuse, sexual abuse, sexual assault, physical assault—YES or SUSPECTED ○ 0: All other trauma • Dissociative subtype

	<ul style="list-style-type: none"> ○ 1: Depersonalization ≥ 2 OR Derealization ≥ 2 OR Depersonalization = 1 AND Derealization = 1 ○ 0: All others • PTSD <ul style="list-style-type: none"> ○ 1: PTSD diagnosis YES, dissociation NO ○ 0: All others • Dissociation <ul style="list-style-type: none"> ○ 1: Dissociation YES, PTSD NO ○ 0: All others • PTSD + Dissociation <ul style="list-style-type: none"> ○ 1: PTSD YES, Dissociation YES ○ 0: All others • Neither <ul style="list-style-type: none"> ○ 1: PTSD NO, Dissociation NO ○ 0: All others • Service usage count (0-19) <ul style="list-style-type: none"> ○ Sum endorsement of YES for 19 service usage variables • Age when trauma exposure occur <ul style="list-style-type: none"> ○ 1: 6 years of age or younger ○ 0: Older than 6 years of age • Age when seeking treatment <ul style="list-style-type: none"> ○ 1: 12-14 years of age ○ 0: 15-18 years of age
4. Frequencies and descriptive statistics	<ul style="list-style-type: none"> • Continuous: Mean, median, mode, range, distribution • Categorical: Proportions
5. Check for missing data; outcome variables for Aim 1 (PTSD diagnosis, dissociative subtype)	<ul style="list-style-type: none"> • <10%: Listwise deletion for outcome variables for Aim 1 (PTSD diagnosis, dissociative subtype) • 10%-29%: MICE with 3 imputations for outcome variables for Aim 1 (PTSD diagnosis, dissociative subtype) • 30%-69%: MICE with 10 imputations for outcome variables for Aim 1 (PTSD diagnosis, dissociative subtype)
6. Internal consistency reliability for selected	<ul style="list-style-type: none"> • ULCA PTSD-RI • TSCC-A

measures within the sample	
7. Chi-squared tests across groups: PTSD, Dissociation, Both, Neither	<ul style="list-style-type: none"> • Age of trauma exposure (before/after age 6) • Gender • Race • Maltreatment trauma (yes/no) • Medicaid (yes/no) • Primary Residence
8. Create sample characteristics table	<ul style="list-style-type: none"> • Descriptive statistics, group differences
9. Determine proportions of PTSD, dissociation, both, neither	<ul style="list-style-type: none"> • Frequencies/proportions
10. Construct 2x2 contingency table	<ul style="list-style-type: none"> • Proportions of each group for the sample
11. Estimate 4 logistic regression models	<ul style="list-style-type: none"> • (1) Outcome: PTSD Yes/No <ul style="list-style-type: none"> ○ Predictor: Maltreatment Yes/No ○ Covariates: Medicaid Yes/No; Age of trauma exposure (continuous); number of trauma exposures (continuous); gender M/F • (2) Outcome: Dissociation Yes/No <ul style="list-style-type: none"> ○ Predictor: Maltreatment Yes/No ○ Covariates: Medicaid Yes/No; Age of trauma exposure (continuous); number of trauma exposures (continuous); gender M/F • (3) Outcome: PTSD + Dissociation Yes/No <ul style="list-style-type: none"> ○ Predictor: Maltreatment Yes/No ○ Covariates: Medicaid Yes/No; Age of trauma exposure (continuous); number of trauma exposures (continuous); gender M/F • (4) Outcome: Neither PTSD nor Dissociation Yes/No <ul style="list-style-type: none"> ○ Predictor: Maltreatment Yes/No ○ Covariates: Medicaid Yes/No; Age of trauma exposure (continuous); number

	of trauma exposures (continuous); gender M/F
12. Construct tables reporting results of Aim 1	<ul style="list-style-type: none"> • 4 logistic regression models
13. Latent class analysis	<ul style="list-style-type: none"> • 19 dichotomous service usage variables • 2, 3, 4, 5, and 6 class models
14. Class enumeration	<ul style="list-style-type: none"> • BIC • AIC • Lo-Mendell-Rubin Likelihood Ratio Test • Bootstrap Likelihood Ratio Test
15. Construct table summarizing latent class models and class enumeration statistics	<ul style="list-style-type: none"> • Review and discuss with committee and statistician as needed.
16. Evaluate best-fit model qualitatively	<ul style="list-style-type: none"> • Model parameters <ul style="list-style-type: none"> ○ Item response probabilities ○ Class prevalence • Service usage categories • Self-dysregulation theories
17. Describe latent classes qualitatively	<ul style="list-style-type: none"> • Examine model parameters <ul style="list-style-type: none"> ○ Item response probabilities ○ Class prevalence •
18. Construct categorical class membership variable	<ul style="list-style-type: none"> • Polytymous variable with k (k= number of latent classes) categories
19. Estimate multinomial logistic regression model	<ul style="list-style-type: none"> • Select reference level: Low service usage category/largest group • Outcome: Class membership (k categories) <ul style="list-style-type: none"> ○ Predictors: PTSD (dichotomous), dissociation (dichotomous), PTSD-D (dichotomous) ○ Covariates: Medicaid Yes/No; Age of trauma exposure (continuous); number of trauma exposures (continuous);

	maltreatment trauma Yes/No; gender M/F
20. Estimate k logistic regression models	<ul style="list-style-type: none"> • Outcome: Class membership Yes/No for k classes <ul style="list-style-type: none"> ○ Predictors: PTSD (dichotomous), dissociation (dichotomous), PTSD-D (dichotomous) ○ Covariates: Medicaid Yes/No; Age of trauma exposure (continuous); number of trauma exposures (continuous); maltreatment trauma Yes/No; gender M/F
21. Construct table reporting results of Aim 3	<ul style="list-style-type: none"> • Multinomial and/or logistic regression models
22. Subgroup analyses: Repeat Aim 1 and Aim 3 for subgroups	<ul style="list-style-type: none"> • Age: 12-14, 15-18 • Age of trauma exposure: Before age 6/After Age 6 • Gender M/F • Medicaid Yes/No • Maltreatment Yes/No

Appendix C: NCTSN Core Data Set Variable Names

Construct/Measure	Variable	Variable Name
Dataset= BASELINE		
Demographics	Race Gender Age Insurance (Y/N) Public insurance Primary residence	NEWRACE<NRACE> GENDER<ZSEX> DOB<DATE> BCINANY<CTYNUN> BCINPUB<ZYES> BPRIMRES<CTDORE>
Service Usage	Inpatient psychiatric unit Residential treatment center Detention center, training school, jail, prison Group home Treatment foster care Probation officer, court counselor Day treatment program Case management, care coordination In-home counseling Outpatient therapy Outpatient psychiatrist treatment Primary care for trauma-related symptoms School counselor, psychologist, social worker Special class or special school Child welfare, Dept. of social services Foster Care Therapeutic recreation service or mentor Hospital ER Self-help group	BOSINPSY<CTYNUN> BOSRES<CTYNUN> BOSDET<CTYNUN> BOSGROUP<CTYNUN> BOSTXFOS<CTYNUN> BOSPROB<CTYNUN> BOSDAYTR<CTYNUN> BOSCASM<CTYNUN> BOSINHME<CTYNUN> BOSOUTTX<CTYNUN> BOSOUTPS<CTYNUN> BOSPRIMC<CTYNUN> BOSSCHCN<CTYNUN> BOSSPCL<CTYNUN> BOSCHWEL<CTYNUN> BOSFOST<CTYNUN> BOSREC<CTYNUN> BOSER<CTYNUN> BOSELFH<CTYNUN>
Dataset= TRAUMA		
Trauma History	Sexual maltreatment/abuse Sexual assault/rape Physical maltreatment/abuse Physical assault Emotional abuse/psychological maltreatment Neglect Domestic violence	GT1<CTGETR> GT2<CTGETR> GT3<CTGETR> GT4<CTGETR> GT5<CTGETR> GT6<CTGETR> GT7<CTGETR> GT8<CTGETR> GT9<CTGETR>

	War/Terrorism/Political Violence (US) War/Terrorism/Political Violence (outside US) Illness/Medical Trauma Serious injury/accident Natural Disaster Kidnapping Traumatic loss or bereavement Forced Displacement	GT10<CTGETR> GT11<CTGETR> GT12<CTGETR> GT13<CTGETR> GT14<CTGETR> GT15<CTGETR>
Dataset= BASELINE		
Trauma History (ctnd)	Impaired Caregiver Extreme Interpersonal Violence (other) Community violence (other) School violence (other) Other trauma (other) Number of trauma exposures—ALL Age of trauma—ALL	GT16<CTGETR> GT17<CTGETR> GT18<CTGETR> GT19<CTGETR> GT20<CTGETR> T1FREQ— T19FREQ<CTTRAU> GT1A0—GT20AU
Dataset= BASELINE InForm Table=BRIERE		
Trauma Symptom Checklist for Children (TSCC-A)	Briere: Dissociation Derealization Item- Num Briere: Dissociation Depersonalization Item- Num Briere: Dissociation – Num Briere: Dissociation T Score – Num Briere: Hyperresonspive – Num Briere: Hyperresponsive T Score – Num Briere: Underresponsive – Num Briere: Underresponsive T Score – Num	BTSC24 <CTBRIE> BTSC26 <CTBRIE> BTSCDSN BTSCDSTN BTSCHYN BTSCHYTN BTSCUNN BTSCUNTN
Dataset= BASELINE InForm Table=PTSD SCORES		
ULCA PTSD Reaction Index for DSM-IV	PTSD Criterion B Met – Num PTSD Criterion B Raw Score – Num PTSD Criterion C Met – Num PTSD Criterion C Raw Score – Num PTSD Criterion D Met – Num PTSD Criterion D Raw Score – Num PTSD Score Criterion – Num PTSD Overall Raw – Num	BPTSBMN BPTSBRN BPTSCMN BPTSCRN BPTSDMN BPTSDRN BPTSOCN BPTSORN